Vol 8 No 11

Editorial

THE proposal that the A.B.C. should enter the field of sponsored programmes in competition with commercial stations is bound to cause wide differences of opinion.

Irrespective of the reasons why new revenue is required, there is a principle involved which is much bigger than the event which raises it.

The position of the commercial stations is one which may legitimately call for protection against comparatively huge concerns, such as the A.B.C. competing for business.

Over the years, the A.B.C. has built up a large chain of powerful stations all over Australia, complete with communications &c. on a scale which commercial stations haven't been allowed to do. It has done all these things with public money. All technical and other facilities of Government Departments have been available at all times. The commercial stations might well ask whether there is equity in allowing this organisation, built up under such protection, to vie with them for their bread and butter.

And in making this A.B.C. a commercial undertaking, there will be created another Government-subsidised venture of the type which has caused so much heart-burning in the past. With it go various publications such as the "A.B.C. Weekly," which has already cost the public a large sum to launch and to keep in being. These publications have never paid their way. You pay for them out of licence fees, and again over the counter.

It is apparent that many listeners enjoy programmes without the necessity for taking advertising plugs with them. They like to think there is a broadcasting organisation with no interest other than that of giving service. Many of them consider that if the A.B.C. cannot make ends meet, it is either costing more to run than it should—we have even heard A.B.C. employees make such a charge—or it is simply living beyond its means.

It may be a legitimate question to ask whether the A.B.C. requires extra revenue for plans which will make it virtually a nationalised broadcasting service, run by and for the Government. The original idea of a Commission was that it should be just the opposite—a completely independent body owing allegiance to no one.

Few will believe the A.B.C. is in this position today. It has all the possibilities of the biggest propaganda monopoly this country has ever seen. Many disturbing incidents have come to light in the past to indicate how politicians have attempted to use it. How many cases may there be which have not come to light?

The man in the street when he thinks of these things is entitled to ask all the questions we have raised, and to look for answers. He may be pardoned for imagining that behind this move there is more than meets the eye.

John Moyle

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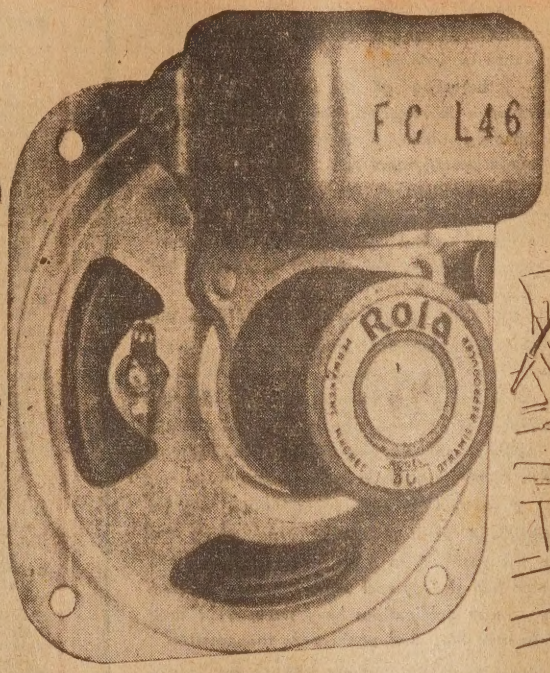
ANISOTROPIC ALNICO



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ROLA

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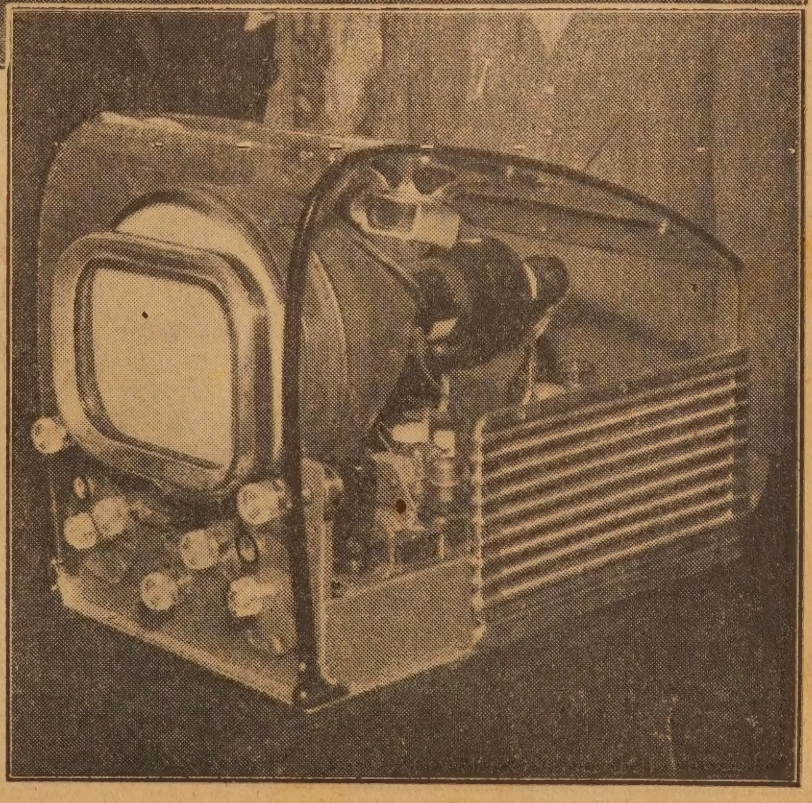
DE-LUXE TELEVISION RECEIVERS

TELEVISION SHOW IN NEW YORK

Above: The Hampshire model Du Mont de luxe television receiver. It has a 20-inch direct view tube which serves as the screen itself. It has AM and FM, 13 television channels, four short wave bands and an automatic record changer. The screen itself is retractable.



Below: A Farnsworth television receiver set encased in lucite so that observers can see the inside of the instrument. This particular set is of the table model type which were on display at the television show in the Waldorf Astoria Hotel.

By Denis Johnston

The Art of Television

THE EXCITEMENT OF CREATION

Whatever the pros and cons of television in Australia or elsewhere, one must agree that it inspires an infectious enthusiasm. "I think it is fair to say that there is nobody connected with the development of television who is not convinced in his heart that . . . it qualifies as an art," says Denis Johnston, Programme Director of the BBC's Television Service, in discussing this medium, which gives to all concerned with it "the rare excitement of creation."

IT would really need an Oscar Wilde to define adequately what an art is, and to prove satisfactorily that this new thing—television—falls within the definition. We who are executants rather than critics, sometimes find it hard to theorise about what we are trying to do.

We see too many of the trees and too little of the wood. We know what we are after, but we find it difficult to express it, except in terms of the thing itself. Nevertheless, I think it is fair to say that there is nobody connected with the development of television who is not convinced in his heart that—whether in fact or in embryo—it qualifies as an art, and is much more than just a new and easy method of communication.

It is not just a way of seeing what is going on in a theatre without having to buy a seat. It is far more than "home movies"—an easy means of going to the cinema without having to leave your own fireside. It is, we believe, the beginning of an art form in its own right, though if you ask us to tell you precisely what course it will eventually take, we will frankly admit we do not know.

If this sounds a little dogmatic and self-opinionated, I can only plead in excuse that it is the way television takes one. It breeds fanatics. We live in a world of exaltation and frustration, where every new programme provides one with the excitement of trying to do something that may never have been done before — some new trick of presentation, some new use of vision wedded to sound.

Its disappointments are enormous and continuous; but, in compensation, it does give to actor, to producer, to cameraman, and to sound-and-vision-mixers the rare excitement of creation. And if that does not mean that it is an art—well, I do not know what else it is.

WORK OF PRODUCER

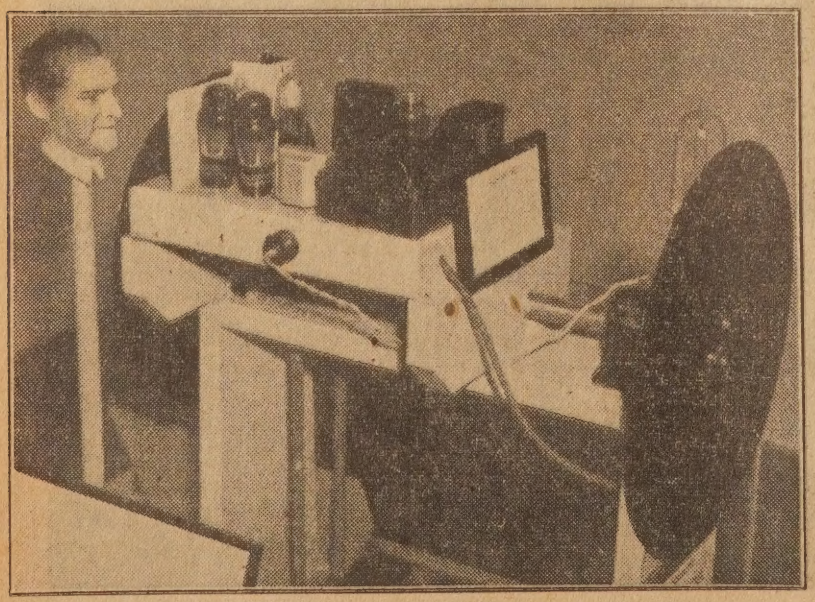
In the theatre, I think it is fair to say that the work of the producer is virtually over as soon as the curtain rises. In television it really only begins as a programme starts going on the air.

Just consider for a moment all the various elements that the producer and his technicians have under their control. In addition to all the paraphernalia of sound broadcasting—the various microphones, their level, their balance, and the blending of one with another—they have under their control an unspecified number of electric eyes (the best description, I think, of televison cameras) which have to be played for all the world like musical instruments. They control the composition of the picture as the actors move around the floor. They have to decide from moment to moment the best angle of vision and the most effective distance from the object.

Above all, they have the immense power, which they share with the film director, of deciding on what they will focus the attention of the audience, irrespective of what is being heard.

In the theatre, apart from tricks of lighting and grouping, it is largely left to the caprice of the onlooker what part of the stage he chooses to watch. If an actor cannot hold the attention of the audience by his performance, it is just too bad, and somebody else in the background may steal the scene.

But in television, as in the cinema, the producer is all-powerful in deciding what the viewer sees or does not see.



This disc-type of televisor, now displayed in Sydney's Science Museum, was used in 1932 for experimental work by Sydney radio amateurs. It is in striking contrast with modern electronic equipment.

It is he who decides what it is important to emphasise and what may be ignored; and the control of the medium that this power gives him is something quite extraordinary.

On the other hand—unlike the film actor—the television artist's performance is live and continuous. There are no takes and retakes; no shouts of "cut" once the play starts; no feeling round with his feet on the floor for bits of wood that tell him when he is in camera shot. For it is the business of the television cameras to follow the artist round as he plays his part, and not the artist's business to worry about the cameras.

ACTOR'S TECHNIQUE

In this way, the actor can combine some of the advantages of both stage and screen. He does not have to paint his part in broad colors and pitch his lines over the footlights in such a way that they can penetrate to the back of the pit. He plays most of his biggest scenes in close-up, with all the opportunities for subtlety that this involves. He can convey his meaning with a twitch of the lips or a movement of the eyes, and can be sure that this does not pass unnoticed if the producer knows his job.

It is true that he cannot repair his mistakes by doing it all over again, but, on the other hand, he can really give a performance, which I believe more than compensates for the strain

At Alexandra Palace—In this room the producer makes his selection from the pictures televised on different screens.

In short, television will, in due course, develop an entirely new kind of acting—and when it is combined with good production and experienced camera work, it will be something quite distinct from either of the older arts of stage or screen.

That is why I am not at all impressed by the argument that a performance in television can never hope to compete in quality with a performance in pictures. Once done, they say, it is gone forever, with no chance of a retake. Perhaps so, but this very fact should give it a life and character of its own, just as the actual placing of a good instrumentalist is always more exciting than any mechanical reproduction, however faithful.

ART IN ITS OWN RIGHT

The fact of the matter is, of course, that television is not really comparable either to the stage or to the screen, because it is something that is really quite different from both. And this fact is its best claim to be considered as an art in its own right.

Its differences from the theatre are obvious, and they can be best seen in our inability to crush into the dimensions of our small screen a play intended for production on a wide stage. At present, we have to try and do so, of course because there are very few plays written primarily for television. But it is seldom satisfactory. Its difference from moving pictures is even more fundamental although, oddly enough, more difficult to explain.

Perhaps I can put it this way. In the cinema, you have a talking picture. The thing that holds your attention and really tells the story is what you see. All the real ingenuity of creation and production goes into the cutting and arrangement of the visual part—into the montage, as it is called.

You can usually enjoy a good foreign picture quite a good deal even if you do not understand the language.

Vision wedded to sound—Geraldo and his orchestra with Sally Douglas and Trio. Modern equipment has advanced television camera technique until it rivals that of the sound film.

CONTRACT SIGNED BY TELEVISION

A legally binding business contract simultaneously signed by contracting parties more than 200 miles apart, yet seeing and hearing each other by television, resulted in the first use of this newest medium of communications to consummate a business agreement. The signers were representatives of Chevrolet Motors and the DuMont Television Corp. Above is the New York party as they show their contract to the men in Washington. Left to right are: Sam H. Cuff, Manager of WABD; Dr. Allen B. DuMont (holding contract); Win Case of the Campbell-Ewald Co. of Detroit, and Leonard F. Cramer, DuMont Executive Vice-President.

But try closing your eyes some time; try listening without looking, and you will notice how comparatively unimportant the sound part is—how unintelligible the whole thing becomes. It is, in fact, a moving picture that talks.

Now television, for some reason that I cannot fully explain, is precisely the opposite. In this case, it is what you hear that really carries you along, while the picture illustrates and amplifies it. If the picture fails for some reason, the sound may not be fully intelligible, but it is very much easier to follow than the vision is without the sound. In a sentence, television is not a moving picture that talks, but a broadcast that you can see; believe it or not, there is a very big difference between the two.

SIGHT AND SOUND

Some people try to explain it away by saying that it is just a matter of the size of the screen. But after puzzling over this phenomenon for some years, I have come to the conclusion that it is something far more subtle than that, and that the operative word is broadcasting.

We are apt to forget in our excitement over this new toy—vision—that television as an art has its roots in broadcasting, and that all the problems that it presents, when you come to analyse them, are problems neither of stage nor screen but of broadcasting.

Broadcasting is now probably the most universal and popular of the arts. It functions for the entertainment of an audience numbered not in thousands but in millions. But—and here is the point—they are millions of individuals, and not masses of people sitting in rows of seats as they do in the theatre or in the cinema, reacting together.

People are receptive in quite a different way when they are alone—or nearly alone—from when they are in a crowd, and the accomplished broadcaster will always recognise this fact. However many millions there may be listening to him, he speaks to them intimately, as individuals, and not as to a public meeting.

TELEVISION ART

But when I described broadcasting as an art, I really meant that it is three-quarters of an art. It is an art—to my mind, at any rate—that wants just a little something else to make it complete. And that thing surely is vision?

Looked at in this way, television is not the illegitimate offspring of either stage or screen. It is neither a theatre, peered into through an inadequate oblong keyhole, nor the local cinema piped into the home, like gas or electric light. It is the natural end of broadcasting. It is broadcasting set free from the limitations of the ear alone.

So, even if the screen is small, it is not very much too small for what television is best suited to as a medium: private viewing by groups of three or four people sitting at home. And I would go so far as to say that, in the course of its natural development, it will probably have as much effect on family life and habits as the motor car and the newspaper.

Television bears all the hall-marks of its age and generation. It is bound to be very highly centralised, and yet it is essentially popular and democratic in its appeal. Its turnover both in artists and in material is enormous, and is certain to expand even more. It is extremely expensive to run, and yet in a country where austerity is bound to be the rule for some time to come, it is going ahead by leaps and bounds, quite regardless of the fact that neither money, nor men, nor materials are available in proper quantities to satisfy its needs.

LURE OF TELEVISION

But that is the way of television. It is a violent and a healthy youngster, giving very few opportunities for alibis or delays or waste. There are not many inducements to a man to be connected with it at all, except the excitement of the medium and a belief in its future. Those engaged in it find it rather more than a whole-time job, and the golf widow has nothing on the television widow.

But it has its compensations in those moments when the camera has mixed to the last caption of a complicated show, and the producer gives his final directions: "Bring in Grams. Hold that shot, Camera Four. We're on you now. Stand by to fade out on the last bar. There you are now. Fade out vision and sound together. Got it! Thanks a lot everybody, for a grand show."

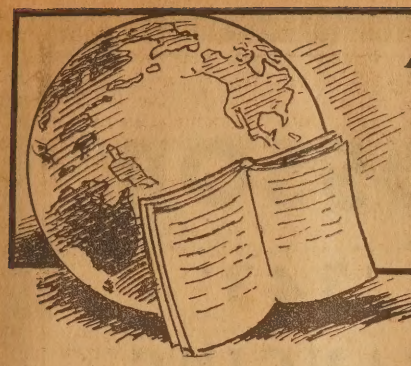
And the cameramen climb off their dollies; the studio manager unplugs his headphones and coils up the long lead; and the artists troop across to the dressing rooms to clean off their make-up, while the stage crew are already striking the scenery to leave the studio floor clear for the next transmission.

USA TELEVISION COSTS INCREASE

TELEVISION receiver costs are likely to be considerably higher than previously estimated, the "New York Herald-Tribune" reports. Present indications are that prices will be roughly one-third to one-quarter higher than originally expected. With installation and guarantee costs added, the advance becomes even more impressive.

This would place some of the lowest-price sets close to $300. Many of these, it was indicated, will include only television sight-and-sound, with standard frequency modulation broadcasting reserved for the high-priced models.

That the increase will come as a disappointment to many would-be purchasers of sets can be inferred from the recent survey released by Sylvania Electric Products, Inc. The survey showed that the average price quoted by families interested in buying a set is between $200 and $250. However, 43% thought they would pay between $150 and $250.



Technical Review

MOLTEN ZIRCONIUM IS NEW LIGHT SOURCE

Blazing with one sixteenth the intensity of the sun's surface, a speck of liquefied zirconium in a sturdy gas filled envelope provides a light source of extreme brilliance and high concentration.

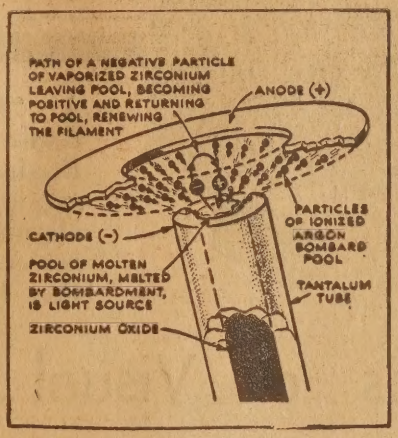
ZIRCONIUM, known since 1786 and previously used in ceramics, is a metal with a high melting point. Zirconium oxide was used in the first gas mantles and in a German experimental bulb nearly 50 years ago, but its latest application is a war secret just revealed.

BIG POSSIBILITIES

The sensational new bulb was developed by Western Union researchers seeking to devise better tubes for communications. Now on the US market in 2- to 100-watt sizes, the bulb is declared by its developers to offer possibilities of better movie projection, clearer and sharper optical magnification.

Wholly new is the use of a liquid instead of a solid or gas filament. Zirconium oxide is placed in a hollow negative electrode, enclosed with its positive partner in a bulb filled with argon, an inert gas.

Heated electrically, the zirconium oxide becomes a conductor, loses its oxygen, and melts to pure zirconium. In this state it is bombarded with argon ions so that it glows brilliantly.


PATH OF A NEGATIVE PARTICLE OF VAPORIZED ZIRCONIUM LEAVING POOL, BECOMING POSITIVE AND RETURNING TO POOL, RENEWING THE FILAMENT
ANODE (+)
PARTICLES OF IONIZED ARGON BOMBARD POOL
CATHODE (-)
POOL OF MOLTEN ZIRCONIUM, MELTED BY BOMBARDMENT, IS LIGHT SOURCE
TANTALUM TUBE
ZIRCONIUM OXIDE

Ionization causes most of the zirconium that rises in vapor particles to return, but a little is lost each time the bulb is used. Average life of a bulb, depending on size, is 175 to 1000 hours.

Below: The concentrated arc projects sharp images on a wall without a lens. Here it has been placed behind a piece of coarse cloth and a fragment of coral. Shadows are clear despite their great enlargement.

WHITE LIGHT

The light is much whiter than that of the tungsten filament, and unlike that of the mercury arc it contains all wave lengths of the spectrum. It is high in ultraviolet content—which may make it useful for medical treatments—and very active photographically, cutting exposure times.

Each square millimeter of liquid zirconium produces about 100 candlepower of light, 10 times that of tungsten but slightly less than that of the carbon arc. In comparison, the sun has about 1600 candlepower per square millimeter of surface.

The glowing zirconium in the smaller bulbs is practically a pin point. Like a pinpoint camera it will project an image without a lens.

The small source also makes it possible to use the lamp to test and demonstrate lenses without the elaborate apparatus needed to produce a pin-point source of light in an optical laboratory.

NEW OPTICAL SYSTEM

The bulb has obvious possibilities for photographic enlarging, but requires a new optical system. Because of the light's intensity and its concentration in one direction, it shows up any flaw in a negative or condenser—dust specks, fingerprints, strain lines in the glass—usually concealed by the diffusion of an ordinary lens' optical system.

More immediately practicable is the use of the bulb with high-power microscopes. Prof. Harry L. Smith, head of the Physics Department at Michigan State Normal College, has used both the 10- and 25-watt bulbs as a light source below the microscope. He reports "there was plenty of light and the definition was greatly improved over that obtained with the ordinary light source."

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(5) When used in conjunction with the model 339 Oscillograph, the wide band amplifier of the Oscillograph can be used on a stage to stage signal tracing test, as a means of locating faults or carrying out functional tests.

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RADAR CAN PREVENT AIR COLLISION

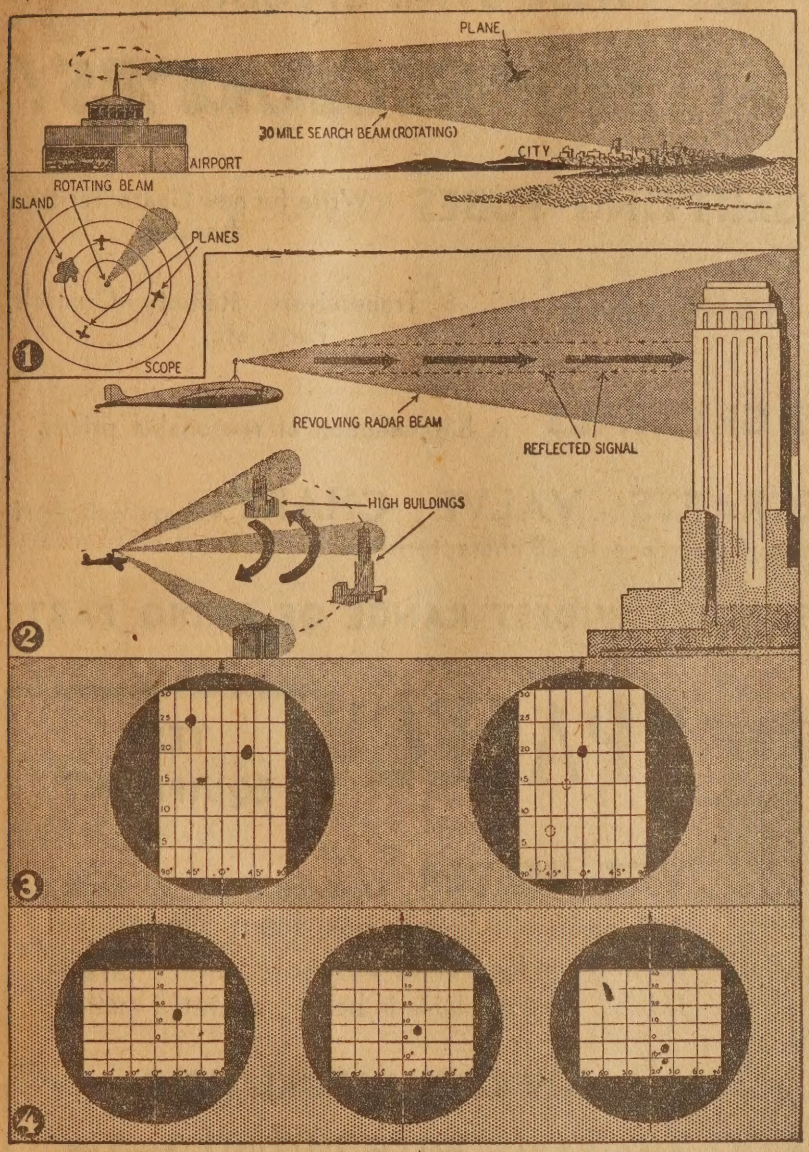

Fig. 1—How GCA guides planes in its area.
Fig. 2—Plane radar would be more effective. Radar beam could either rotate or oscillate.
Fig. 3-a, left—Typical B-scope radar screen.
Fig. 3-b, right—Pilot turns slightly to right and obstacle drops to left and down.
Fig 4—C-scope shows height and distance. At A, left, obstacle is 15 degrees above the line of flight. At B, centre, plane rises and obstacle drops to 8 degrees. At C, right, the plane has risen safely above the object.

This article from "Radiocraft" not only makes a good case for GCA equipment, but for radar generally, as a means of avoiding air collision. It also explains the "B" and "C" scope types of radar display as against the "A" scope and "PPI" more often used.

RECENT crashes of planes into tall buildings have roused much public sentiment. Residents of large cities demand safeguards against such accidents. Less spectacular but equally important have been occasional crashes —in fog, storm or darkness—on remote mountains. Radar has been the remedy most often advocated. Other radio devices could also be used to prevent recurrence of these disasters.

Most prominent in the news as a means of preventing collisions such as the Empire State Building tragedy, July, 1945, and the crash of an Army transport plane into a 67-storey building at New York City last May is the GCA (Ground Control Approach).

Its great advantage is that it is entirely self-contained and does not require that the plane carry any special equipment. All the pilot needs is the usual radio receiver over which he hears instructions given verbally from the ground.

The GCA system is a PPI (plan position indicator) radar installation. With its 30-mile long-range search beam sweeping over the skies of New York, the planes which crashed head-on into skyscrapers could have been located and guided safely to one of the airports near the city. Fig. 1 gives an idea of the protection that such a beam would give to a city within its range.

GCA USEFULNESS

The usefulness of GCA to the pilot would not stop with warning him away from danger areas. He would be given a course to fly that would bring him to the approaches to the field. At six miles the image of the plane would appear on the scope of a high-precision radar used for landing the craft.

The pilot, by following the instructions of the ground operator, can bring his plane safely down on the field, though it be so covered with fog that be cannot see the ground.

A strong argument for GCA is that many units are already available—some actually on the fields in which they would be used. Little work would be needed to get this system working on many airfields.

GCA is limited to a range of about 30 miles from the airfield on which it is installed. It can give no protection to planes lost at great distances from airports — planes which often crash into mountainsides not suspected to be in their path. Radar aboard the plane itself is the answer suggested by some experts.

TYPES OF DISPLAY

With radar equipment the plane could discover any obstacles whatever if they were close enough to the line of flight to be within the beam. This could be fairly wide, and in more elaborate installations the beam might be made to oscillate (mechanically or electronically) to cover a wider area.

The indicators most suited to obstacle detection are the B and C scopes. These were standard types of military radar, if not as well known to the public as the simpler A scope or the more complex PPI. Presenting the maximum amount of information with the minimum of weight, plane-borne equipment using these scopes would weigh about 145lb.

The face of the B scope is laid out in a grid, as shown in Fig. 3. The vertical line up the centre is the line of flight. The vertical scale is calibrated in feet or yards and indicates the distance to the object detected. The horizontal scale, calibrated in degrees, shows whether it lies to the right or left of the line of flight. The pilot sees any building or obstruction which reflects back the beams from his radar antenna as bright spots or pips of light, their position giving the distance and bearing of the obstruction (Fig. 3-b).

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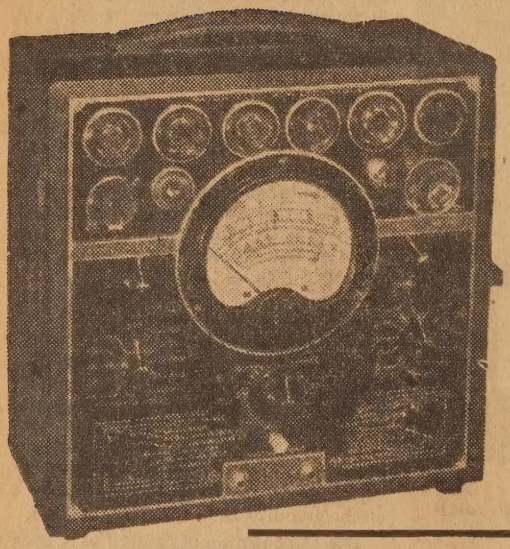

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THE RADIO SPECIALISTS

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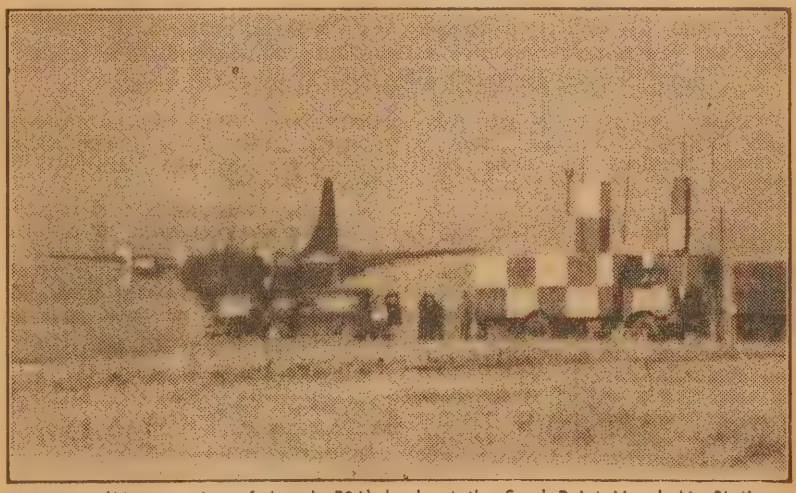
The type C scope gives the altitude instead of the distance of the obstacle. The pilot thus knows the direction and approximate altitude of the object with reference to his own plane. He can see —by watching the pip of light on his screen — whether he is veering away from or toward it and if he is rising safely out of the danger area.

Fig. 4-a shows an obstruction 15 degrees above the line of flight and 30 degrees to the pilot's right. Rising, he brings the obstruction down to five degrees above his line of flight—in 4-b —but has drifted nearer, so that it is only 25 degrees to his right. In Fig. 4-c he has risen eight degrees above the obstruction, which is still about 25 degrees to the right. If the plane continues to rise the pilot may consider himself safe.

Proponents of plane radar point out that GCA and other systems depend on a plane being within reach of a ground station. Radar will indicate any obstacle anywhere! A plane lost in fog or driven far from its course in a storm needs indications of nearby obstacles far more than one which is on course and knows its approximate location. GCA may offer protection to the inhabitants of large cities; plane-borne radar offers that protection to the occupants of the plane itself. This is a feature that will go far to offset the extra weight of radar equipment.

G.C.A. SYSTEM IN OPERATION

Nineteen-year-old Radioman 3/c, of Loma Linda, California, directs the azimuth position, which is scanned on the scope immediately in front of him. Its findings are co-ordinated on the meter at left, which tells the deviation of the plane from the centre of the course to the runway. The meter partially visible at extreme left, records elevation in feet, above and below the glide path. The final controller usually stands at left and behind the operator and gives voice radio directions to the plane after co-ordinating findings on the meters.



Privateer (Navy version of Army's B24) lands at the Sand Point Naval Air Station here, during demonstrations of "blind" landings by means of a ground control unit. At right, the mobile GCA unit, known as "Pappy," contains radar and radio equipment and controls the flight of a landing plane from a position near the end of the runway

HIGH FIDELITY AMPLIFIER

Frequency response within plus or minus one db over the range from 50 to 14,000 cycles is a feature of a new phonograph, the London Reproducer, now on the American market.

THE circuit of the amplifier contains four stages of pushpull triodes. A low-impedance balanced-armature pickup feeds via bass-compensating R-C circuits to the grids of two 6J5 triodes. After passing through a second set of 6J5s the signal is fed through a compensated twin volume control to another pair of 6J5s which are capacitively coupled to the grids of two PX25 output tubes. (The British PX25 is somewhat similar to the 2A3 but has a higher output rating).

Each grid load is provided by half of a centre-tapped choke having paralleled resistors, so that at all audio frequencies covered the inductive portion of the load is approximately four times that of the resistors to maintain linearity at low frequencies.

In the first three stages separate unbypassed cathode resistors are used for each tube to correct any existing unbalance and nonlinear distortion. Volume control between stages 2 and 3 is achieved by twin resistance-capacitance circuits shunted across the output of stage 2, anode to anode, the capacitive portions of the network providing bass compensation at low volume levels.

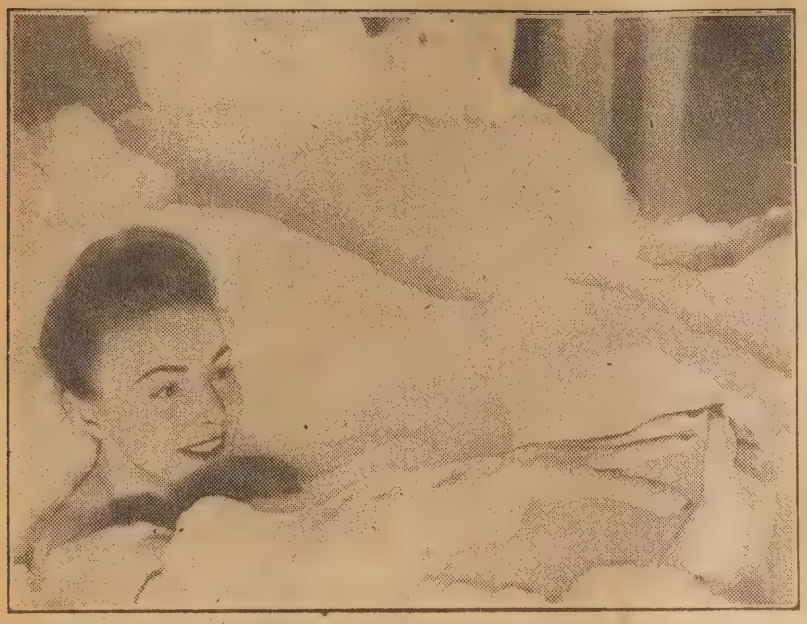
Eight tubes are used, six 6J5 triodes and two PX25 triodes, all in matched pairs. The rectifier is a 5U4G. Precaution against damage to the output tubes has been taken by providing individual cathode bias resistors and grid and anode series resistors that act as stoppers to stop parasitic oscillation.

The amplifier output is six watts at 1000 cycles. It is unnecessary to have a higher wattage because of the efficiency of the speakers.

The needle armature unit is about the size of a half-walnut shell and places a weight of only 27 grams on the disc. The case of the pickup is of moulded plastic, the two halves being hinged at the rear and secured by a single screw. The sapphire point is free from self-resonance over the frequency range, and has a radius which enables it to track the highest audible frequencies accurately.

Two models are available, one having three 12-inch p-m loud-speakers, the other having six.

WHAT PUTS THE SLIDE IN SOAP?



An example of the "suddiness" of soap is provided by this picture, in which the lady is quite submerged in a mountain of them.

Soap is one of the greatest discoveries of history. It is so common today that it is difficult to imagine how life would proceed without it. And yet few people ever give a thought to the methods used in its production, or for that matter, how it came into being.

To many people, of course, commonly "called dead beats," soap is a most obnoxious and unnecessary substance and an inconvenient discovery.

In very early days washing wasn't thought of very much; no one had much time. What with hunting, fighting and running away from dinosaurs, pterodactyls, mammoths and vicious animals, there were not many spare moments left to attend to the daily ablutions. Nobody worried much and even if one arrived at the stage where "even his best friends wouldn't tell him," he wasn't noticed, as everyone was alike and had no friends anyway.

DID YOU SANDEX?

Some centuries later, perhaps, someone may have accidentally rubbed some sand over himself and noticed that he was actually a different color. He was outstanding by comparison, and, although he was probably called a "cissy" by his mates, it would be inevitable that a fashion would be introduced and he would soon have plenty of followers. Thus the first stage of washtub slavery was reached, and smoke signals would advertise "Did you Sandex yourself this morning?"

Now sand is a little harsh to schoolgirl complexions, and softer substances were sought which achieved a similar result without the annoying after-effects. So we come down to the middle ages.

In those days we find a number of substances were used to dissolve or grind away the accumulated grime, such as olive oil and the juices of plants. Even ashes were used, although the effects of these were as unpredictable as those of sand. Fullers Earth was a popular cleanser —this was a kind of clay.

PLINY'S SOAP

In the 1st Century AD the Roman writer Pliny mentioned soap, and referred to two kinds, hard and soft. He volunteered the information that it was a Gallic invention. Another writer says that the early Greeks knew about soap. He omitted to say whether they used it or not. He just said they knew about it and left it at that. It is certain that the Romans used it, for a soap factory was discovered in the ruins of Pompeii. However, only the rich people used it, as the manufacture was a government monopoly and the product was expensive.

by Calvin Walters

After the course of time, some ill-disposed person deprived the rich of their monopoly in the use of soap. It was discovered that if fat was treated with soda obtained by pouring water over od ashes, a tolerable though not quite refined soap could be made. This was the process commonly employed for centuries.

SODA FROM SALT

We now come to the year 1791 and we find a chemist, Nicholas Le Blanc, at work on a process of making soda from common table salt. The success of his process gave to the world an inexhaustible supply of useful sodium compounds, and the manufacture of soap was given a tremendous impetus. For the first time it was organised on a scientific basis, when later in 1823 the French chemist Chevreul discovered the composition of animal fats, and what takes place in the action of saponification, which is the action that takes place during manufacture.

From 1823 onwards, the manufacture of soap boomed, until today it is a household necessity which cannot be done without, although a little scarce at the present time.

In the manufacture of soap many oils and fats are used. Although vegetable or animal fats can be used, pride of place is given to the fat from cattle or sheep for ordinary household soap. For the higher grades of fine soap, vegetable oils are used, such as palm oil, olive oil, coconut, cotton seed oil and Soy oil.

The manufacture must be accurately controlled, as excess of fat would result in a too greasy substance, and an excess of alkali would act as an irritant to skin and clothing.

In a large soap factory the soap is made in large vats having a capacity of well over 100 tons. The vats are of steel and are heated with steam pipes.

SAPONIFICATION

The pans are first charged with the required fat or oil and the soda run in. The mixture is heated, and this causes saponification to take place. This means that the fats break up into their constituent parts, fatty acid and glycerine. The fatty acid combines with the soda and forms the soap. After a saturated salt solution is added, the glycerine settles to the bottom of the vat, and can be drawn off as desired.

The boiling process is repeated a number of times in order to purify the soap, and the mass is then cooled

off. The first stage occupies about two weeks.

The next stage is the beating process. For this the soap mass is run off into containers, and beaten smooth by revolving blades. During this process perfume is added. Coloring matter can be intermixed at this point, and, in the case of laundry soaps, resin is incorporated in the mixture during the boiling stage.

The product is now complete and is poured into frames and moulds of various designs and placed in the drying-room where it hardens. The blocks of soap are removed from the frames and cut by machinery into bars which are dried and finally pressed into cakes.

TOILET SOAP

In the making of toilet soap, higher grades of fats or oils are used, as Milady's complexion must not be injured. These soaps are made in exactly the same way as laundry soap up to the drying stage. At this point, the soap is put into mills consisting of a number of revolving rollers in an iron frame. These mills condense the soap which passes from the mill in the form of thin ribbons which are afterwards compressed into a compact mass and cut into cakes. Coloring matter and perfume is added in the mill.

The soaps described are known as hard soaps. Every one of them are pure soap inasmuch as the controls exercised in the manufacture assure that there is no free alkali or excess of fat.

Soft soaps, as used for cleansing of floors and machinery parts, are really impure solutions of soap made from potash with glycerine and caustic soda lye. Linseed oil is often used as a basis, and this is boiled with lye until a sample exhibits no tendency to separate into solid and water when cooled. That is all the process amounts to.

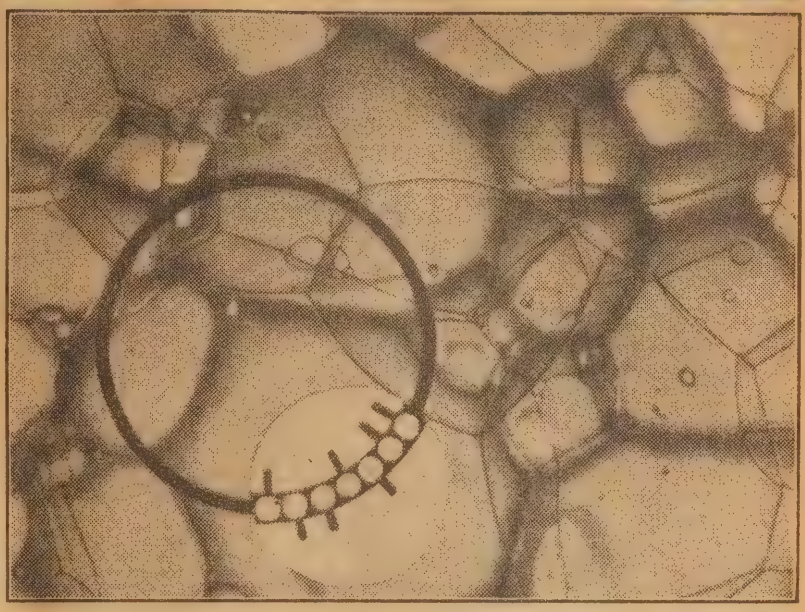
TRANSPARENT SOAP

There is a class of soap which was at one time in great demand. This is the transparent soap commonly called "glycerine soap," although all transparent soaps do not necessarily contain glycerine. These are made by dissolving dry soap in alcohol. This results in a clear solution which is poured off and the alcohol distilled off for further use. The remaining soap is poured into moulds and placed in warm rooms for a few months until it becomes transparent. The dissolving of the soap in alcohol leaves the glycerine in the soap. Other glycerine soaps are made by mixing glycerine and soap in equal parts.

Some transparent soaps are made by adding sugar to soap in a special process.

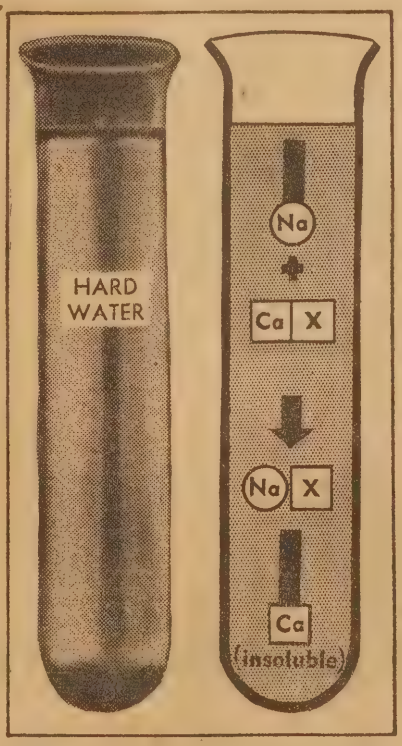
One of the great disadvantages of ordinary soaps is their tendency to elude the grasp in the bath tub. To overcome this exasperating quality, an American firm produced the first floating soap in 1879. This soap was discovered by accident when a careless workman let the mixing plant run during the lunch period. The resulting soap contained millions of air bubbles which kept the soap above water level. The demand was great for a while, but there was a tendency for the soap to wear out too quickly and it lost popularity.

BUBBLE FORMATION OF SOAP



This illustration shows how the soap molecules form a film, with metal ends attracted to water and tails protruding. A bubble pattern is the result.

Until recent years, the reason why soap cleans was a mystery. No one knew exactly why dirt and oil should surrender to the action of soap. This is no longer a mystery, and I will try and explain as simply as possible just what takes place.



Calcium salts in hard water change sodium soap to calcium soap, insoluble scum of no cleaning value.

The main properties of soap are (1) a cleaning action, (2) a wetting and penetrating action, (3) emulsifying and dispersing action.

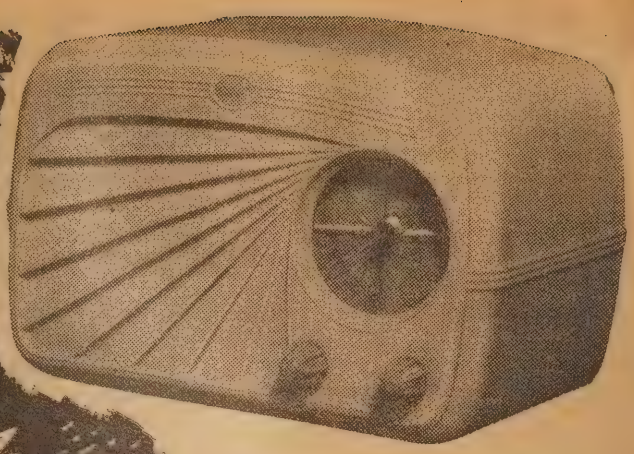
The first quality is well known. The second is noted in that pure water tends to collect in drops on a smooth surface whilst a soap solution spreads. Fabrics are more easily soaked in soap solution because this penetrates more easily than water alone. The third point is noted when a solution of oily dirt is shaken up with a soap solution. The resulting "emulsion" is not easily separated. These three qualities have been observed by all housewives. Now for the reason.

SODIUM SOAP

Soap as outlined above is fat treated with a metallic salt, usually sodium. All fats consist of atoms arranged end to end like a chain. This is called a molecule. Treating the fat with sodium puts a sodium atom on the end of the fat molecule and the result is another molecule which looks like a match. The head of the match represents the sodium atom and the stem represents the chain of fat molecules. Sodium mixes with water but fat does not. Thus a soap molecule consists of one end which mixes with water while the other end does not. All this must be clearly understood before you read on.

When a small amount of soap is placed in water, it only partly dissolves. At the surface a film forms which consists of the soap molecules with the fatty end poking out away from the water. This is natural, seeing that the fatty ends don't like water.

The sodium end sticks into the water



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Packed with features including 5 band operation, high fidelity output, dual speed tuning, magic eye indicator etc., and housed in a delightfully veneered wooden cabinet, the 98 gives instant appeal to the Connoisseur —Price £58/13/6—West Australia—£59/16/6.

RADIO Mullard VALVES

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because it likes it. If the water is shaken, a cloudy solution forms because the soap does not truly dissolve. Small groups of soap molecules get together, so to speak, with the fatty ends sticking together, and the sodium ends out in the water The fatty ends stick together because they have no place to go.

OIL AND WATER

Now add some oil to the water. Immediately a place is provided for the fatty ends of the molecule to go. Friends have arrived. Fat mixes with fat, and in travelling, the fatty end carries the soap molecule into the place between the oil and water. The sodium end is still in the water but the fatty ends are together in the oil.

Now if the oil and water mixture is shaken enough to break the oil into drops, the soap molecules have a vastly increased number of surfaces in which to fix themselves. Each drop of oil becomes covered with soap molecules with the fatty ends in the oil and the sodium end in the water. Thus a bridge is formed between the two unlike materials, water and oil. Further, the oil has little chance of coming together again, as the molecules, once in position, are hard to shift. Thus we have a mixture of oil and water in the form of an emulsion.

Now apply the knowledge we have gained to the action of soap as a cleanser. Mix the soap in water. The soap molecules arrange themselves with the fatty ends sticking outwards These grab onto any oily or fatty substances that they touch and lift them off the surface of the substance being washed. They form an emulsion in the aforementioned manner, and since the fatty substances hold the dirt, this too is brought into suspension in the water and washed away.

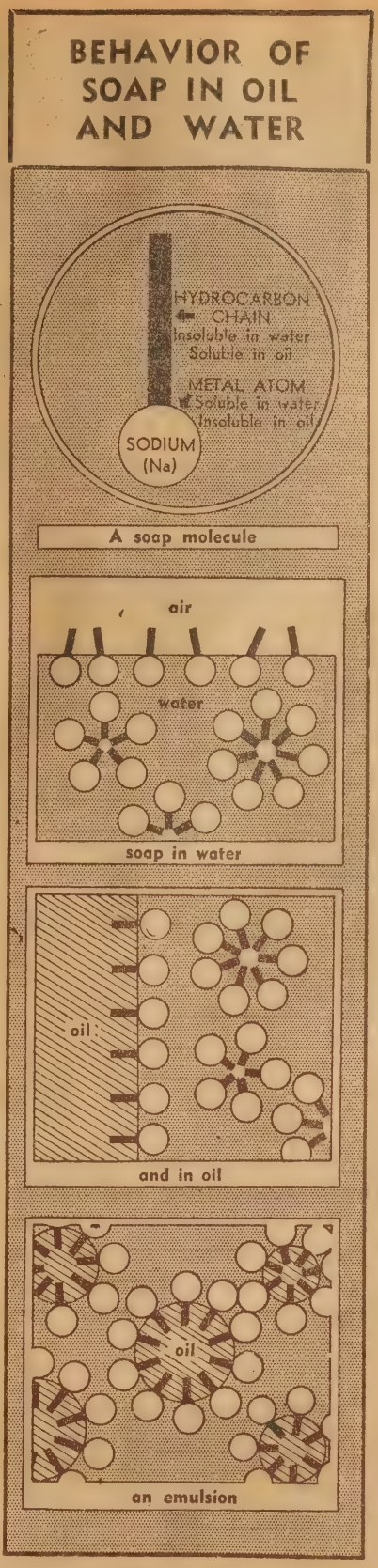
SUPERSEDING SOAP

Although soap is our best-known cleansing agent, it is in grave danger of being superseded by synthetic substances which show great promise.

Soap has certain disadvantages, chief of which is its inability to form a lather in hard water containing calcium or magnesium salts. These salts form insoluble curds with ordinary soap, and are responsible for the ring round the bath tub, and the difficult cleansing of glass and clothing in hard water. They cause a great waste of soap unless the water is softened artificially, which is a great inconvenience. Soap is also almost insoluble in cold water, and in the presence of acids forms a precipitate.

It is known that some cleansing and dying operations of delicate fabrics can be best carried out at room temperatures, and in an acid medium. This is impossible with ordinary soaps.

The production of synthetic "detergents," as these substances are known, was speeded up during the World War 1 and 2 owing to fat shortages. Methods were found for producing fats from petroleum, but ordinary fats and oils are used in the process which is too complicated to detail here.



These diagrams show how soap acts in removing oil and greasy matter from objects to be cleaned. The action is described in the column at the left of this picture.

For a given quantity of fat or oil, the synthetic substances are more efficient. They are equally effective at one third the concentration of ordinary soap, so that there is a tremendous saving of oil and fat in their manufacture as against that of soap.

SYNTHETICS

Synthetics are today incorporated in dentifrices, shampoos and in bar and tablet form like soap. They are used in America by people who are allergic or sensitive to ordinary soap. In bottle washing, metal cleaners, scouring, dying, they are finding an increased use.

The new substances are excellent for washing wool which is sensitive to alkali, and can therefore with the synthetics be washed in an acid solution. Rayon does not stand high temperatures. With synthetics they can be washed in cold water.

Synthetic detergents have superior wetting qualities, and a novel use for them is in conjunction with either caustic or strong acid in the chemical peeling of fruit. Everyone knows how wasteful the peeling of fruit with a knife can be. The new idea is to treat the fruit for a few minutes with hot caustic soda to which a synthetic wetting agent has been added. This is followed with washing in cold water, and a final rinse in citric acid to remove the last of the caustic.

Hard water is no drawback with the new detergents, as cleansing can take place as easily as with soap in soft water.

It is therefore reasonable to say that soap is gradually falling into the discard, as it seems to have so many disadvantages when compared with the new "soaps." Whether they will help in avoiding that which "even our best friends are afraid to tell us" about is another matter.

AIR DISINFECTION

TRIETHEYLENE glycol, a chemical largely used as a solvent for nitrocellulose lacquer and as an intermediate in the manufacture of plasticisers, is now recognised as an effective bactericide.

In tests, one gram of it vaporised in 200,000,000 cubic centimetres of air rapidly killed the organisms responsible for pneumonia, influenza, streptococcus infection, catarrh, colitis, and other diseases. Preliminary results show that it may even control tuberculosis and the common cold.

At the concentration used, the material is not harmful to persons or animals, fabrics, or painted surfaces. The glycol is effective only at fairly high humidities, which leads to the theory that the moist surface of the organism attracts the hygroscopic chemical, which coats the germ with a lethal layer.

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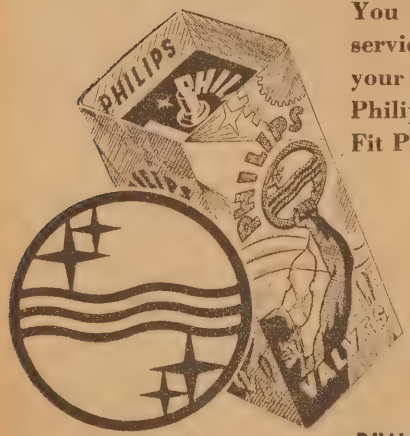

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MANUFACTURE OF LIQUID AIR

Liquid air is used quite widely in industry. Oxygen is obtained from the atmosphere by this means, and nitrogen for fertilisers and for the making of ammonia is collected in the same way. Liquid air is also used as a special refrigerating agent, and even as an explosive.

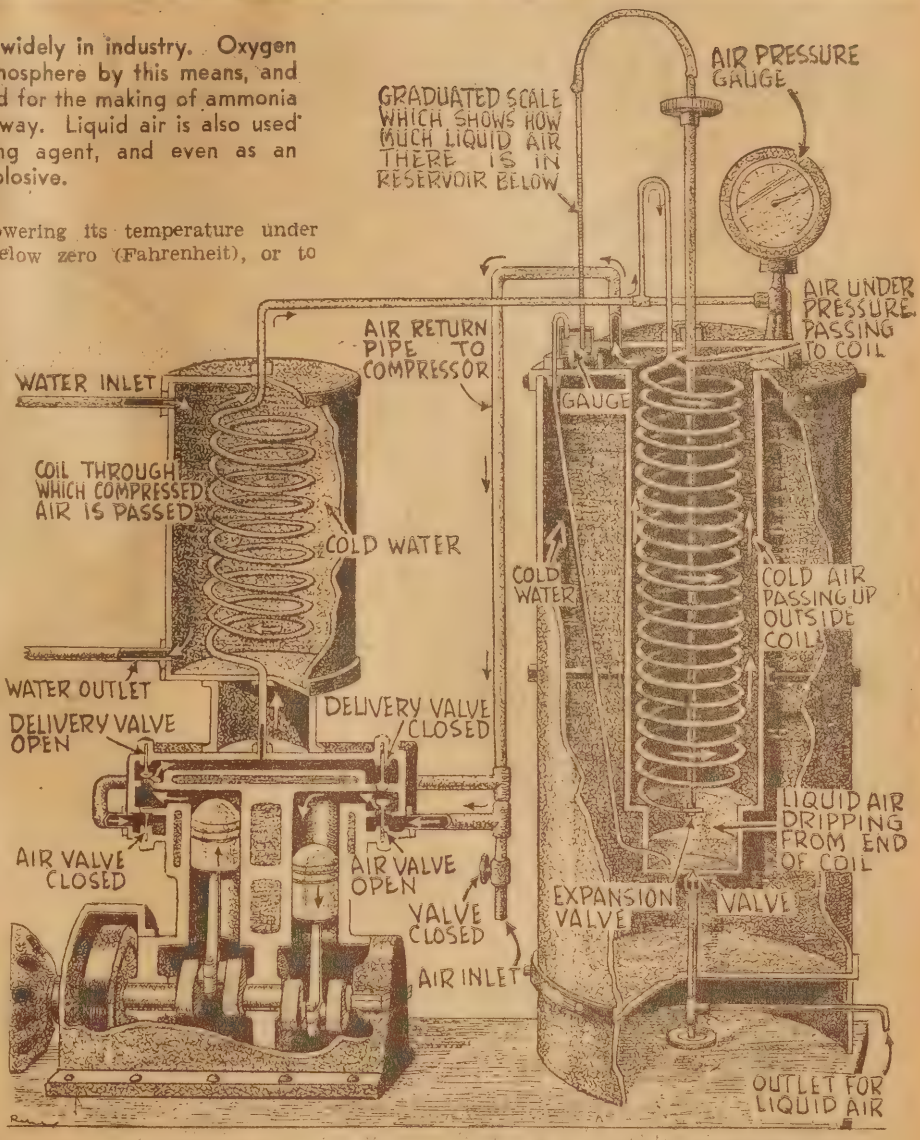
AIR is made liquid by lowering its temperature under pressure to 312 deg. below zero (Fahrenheit), or to 190 deg. Centigrade. At lower temperatures still, liquid air changes into solid.

Shown in this diagram-sketch is the kind of apparatus in which air taken from the atmosphere is made into a liquid.

Air is drawn into a compressor driven by an electric motor (lower left). The piston compresses the air and drives it up through a coil round which cold water is circulating. In this way the air, which is heated by being compressed, is cooled again.

The air is piped across into another and longer copper coil for further cooling. This is set in a sealed compartment, suspended within a cylinder in which cold water is circulating. The heat extracted from the compressed air as it expands is sufficient to reduce the temperature of the air so much that it becomes a liquid. It drips through an expansion valve into a reservoir, from which it is drawn off from time to time.

All the air is not liquefied, but that which remains as gas escapes up the compartment, and being very cold, helps to liquefy the air in the coil. It then finds its way to a pipe which leads back to the compressor, and is circulated again.



COMPRESSION

Compression at which the operation takes place is usually about 200 atmospheres. An air pressure gauge is fitted to show the amount of compression at any time.

A pipe leads from the liquid air in the compartment to a gauge, which contains glycerol. According to the amount of liquid air in the reservoir, so the pressure is conveyed up the pipe and drives up or lowers the amount of glycerol in a graduated tube, which leads out of the gauge. It is thus possible for the operator to tell at a glance how much liquid air there is in the reservoir.

Liquid air is a mobile fluid, not unlike water, but slightly blue in color and not so clear. It can be used as an explosive, and with charcoal it has been widely used for blasting. It exerts a pressure during evaporation of about 10,000lb. to the square inch. As an explosive, however, it is hard to control.

It was discovered in 1894 that, when air becomes liquid, it resolves itself into the elements that compose it—mainly oxygen and nitrogen. The carbon dioxide present early crystallises as a solid, giving the liquid its cloudy appearance, and can easily be filtered out. Liquid nitrogen evaporates more readily than liquid oxygen, and so it comes off first. Thus, as the liquid air evaporates, it becomes richer and richer in oxygen.

Liquid air is stored in vaccum flasks, stoppered with cotton.

BLOCK BUSTERS FOR GERMS

MICROSCOPIC block-busters exist which literally blow disease germs apart.

Discovery of this battle strategy of bacteriophage, a minute virus used to treat certain diseases, is announced by Dr. A. P. Krueger, professor of bacteriology at the University of California.

The death blow comes to disease germs within two or three hours after the virus establishes a beach-hold within the cell. The virus grows 10,000 to 100,000 times, then bursts through the cell wall, Dr. Krueger estimated from a microscopic study of a bacteriophage attack on staphylococcus, the germ that causes boils.

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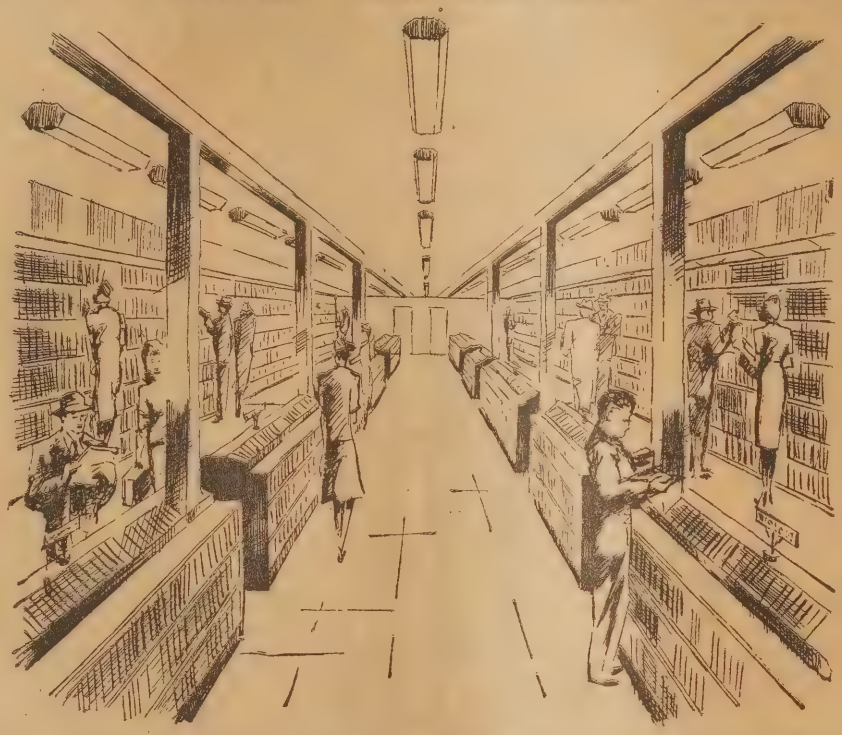

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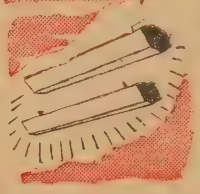

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NEWS AND VIEWS OF THE MONTH

On 6 Metres

INTERSTATE reception and transmission on the 6-metre amateur band remains still the most interesting topic for radio minded people. It will be remembered that as we went to press on our last issue, these conditions had just commenced, and amateurs everywhere were just beginning to wonder where they would end.

Over the Christmas period, things happened with such rapidity and more or less consistency that it is a hopeless task to attempt a detailed list of achievements. In fact, one or two have written pointing out "errors and ommissions" in our last month's list, which, we pointed out, was not expected to be accurate, and in any case, could only cover NSW activity at such short notice.

VK5's Make The Grade

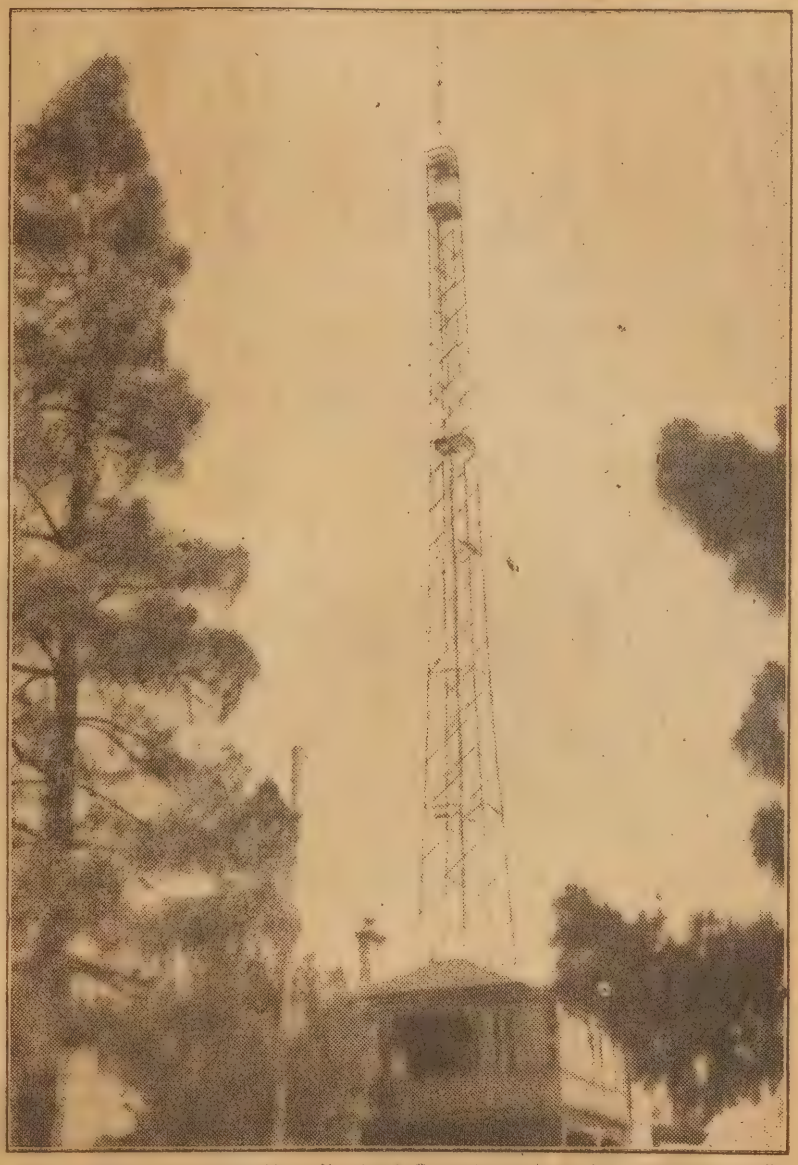
HOWEVER, since then the band has opened up on many occasions, and nearly all 6-metre enthusiasts have now managed some kind of an interstate QSO, although so far, we fancy only NSW amateurs have worked three States. This was made possible by the sudden appearance of VK5 stations round about Christmas Day, since which time they have been heard a number of times. A Bundaberg amateur joined in the fun, and has made several Sydney contacts.

Reports have also been received that Sydney stations at least have been heard in Tasmania, and a Sydney amateur reports that he heard a New Zealander on one occasion at fair strength for a few minutes.

Receivers

THERE is one point we'd like to make in connection with these 6-metre contacts. This is the first time such communication has been made in Australia, and there are a number of fellows who have waited a long time to share in it. In some cases, their contacts have been spoiled by operators of super-regenerative receivers. These receivers often radiate like small transmitters, and a number of them parked on a rapidly fading signal can completely ruin its audibility.

We suggest that owners of such sets refrain from using them when the band is open, or better still, re-build them to converters which will not cause interference. Otherwise, some one is apt to lose patience, and run riot with an axe! Seriously, it is quite an important point. Modulated oscillators and super-regenerative sets are out of place on 6 metres, and there is no excuse for them today.



F. M. AERIAL AT JOLIMONT—The PMG Transmission Dept. has erected this tall aerial mast for use with its experimental F.M. station which has been installed immediately below it. The aerial is approximately one mile from the city proper and is in a fairly commanding position. Regular experimental transmissions are expected to commence in a few weeks. Note the "turnstile" aerial array at the top.

Atomic Energy

PROFESSOR M. L. OLIPHANT, Australian-born leader of research in nuclear physics, now in Australia, is quoted as saying that if atomic energy is made the object of an arms race, it would not be possible to harness it for peacetime purposes.

The Professor here has raised a most important point. It is obvious that if atomic energy and its method of production are to be made the items of power politics, the world of commerce has very little chance of being enlightened on developments and uses of it. The very things which would make it so valuable as a source of everyday power would be the things which would make it more applicable to engines of war.

Until some new influence comes to light, which will have a greater military significance than atomic energy, it seems inevitable that research will be guided more by military necessity than by the needs of society.

2-stage, multi-band

AMATEUR TRANSMITTER

This transmitter has a special appeal for the beginner, as it may be built with or without the modulator, and may be used either with a 15-20 watt input, as described here, or with a 50 watt input by making a few simple modifications.

by John Moyle

IN the last month's issue, we promised to give details of a small but highly flexible transmitter primarily for phone work, but equally suitable for C.W. should this be required.

These details are given in this article. From them, any licensed amateur should be able to duplicate the equipment, and obtain the same results as we have ourselves.

COMPONENTS

All the components should be obtainable with the possible exception of the modulation transformer. The requirement for this item is discussed later on, as it should be possible to use a small power transformer and obtain the required results.

This transmitter was designed originally to provide a simple, low-powered job capable of being operated on all bands down to and including 28 mc, for use as a handy stand-by, and also for some mobile work we hope to do in the near future. For the latter, a vibrator supply will be employed to give 300 volts high tension. For this reason, we have standardised the design so that this voltage is supplied to all valves. It is obtainable from the A.C. supply by the simple expedient of a choke-input circuit with standard receiver power transformer and choke.

The nominal input to the final stage is 15-20 watts, and this is capable of giving quite good results on any band.

In fact, one test we made on 14 mc. was to commence a QSO on a larger transmitter with a input of about 90 watts, our report being R9. On changing without notice to the small job with 15 watts input, the report was R7. Which was most encouraging, to say the least of it.

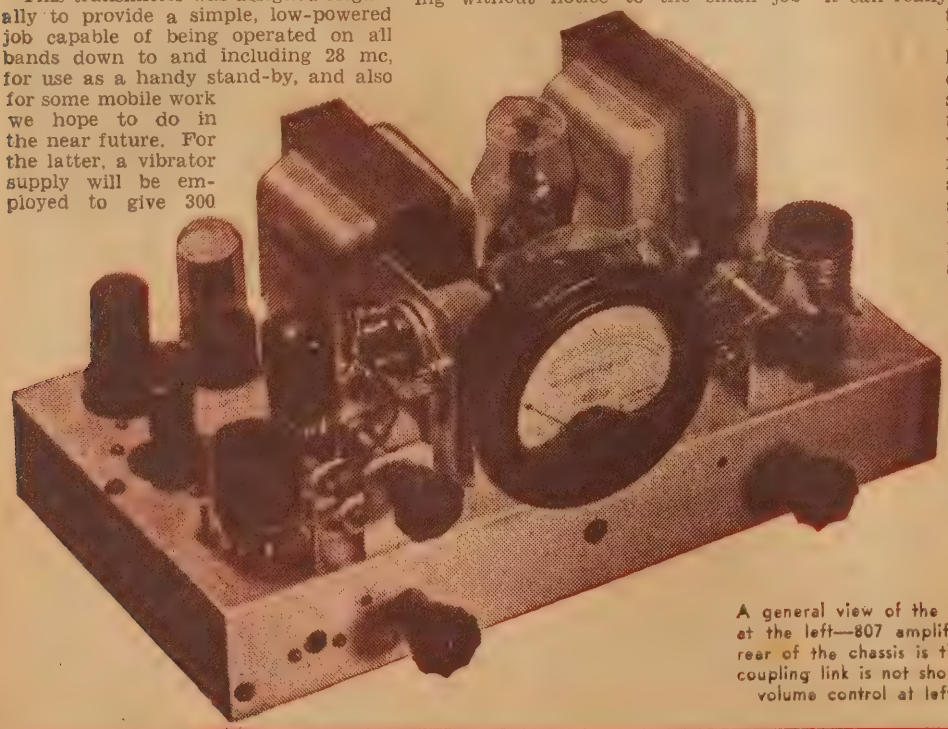
As the essence of the design was to be simplicity at low power, the transmitter automatically selected itself as being a 2-stage affair. Of the possible combinations, a double-triode oscillator or a Tritet suggested themselves for the first socket, followed by an 807 or a 6V6G as the final amplifier.

CIRCUIT DESIGN

Concerning the oscillator, there doesn't appear to be very much to choose between the two possibles, except that the Tritet is perhaps the simpler of the two, and requires only one tuned circuit. As the cathode tuning is fixed for any one crystal, it can really be considered as a fixed-tune circuit.

Ample output would have been obtainable from either method, and considering the low voltage used, the current drain would be much the same in either case. Therefore, as much to be consistent as anything else, we chose the Tritet, which behaved itself well right from the start.

The cathode coil is tuned with a fixed condenser of .0001 mfds, with a 30 mfds air - trimmer connected across it. We found this latter somewhat helpful in getting best output when the 6V6G is used as a quadrupler, as it is on 28 mc. but it would be possible by a little experiment to find a coil size which



A general view of the transmitter. The Tritet is at the left—807 amplifier at the right. At the rear of the chassis is the modulator. The aerial coupling link is not shown in this picture. Audio volume control at left, meter switch at right.

would be the best without the necessity for a trimmer condenser.

FOR 'PHONE WORK

The general characteristics of the circuit are quite standard, with series feed for the screen voltage. As our intention was to produce a transmitter primarily for phone work, a bleed circuit, which would have given better regulation, was not considered necessary.

The plate tank circuit, as will be seen, included a fixed condenser of .01 mfds in series with the tuned circuit, in order to keep the moving plates of the tuning condenser at earth potential. This is a great convenience, particularly if a metal panel should be used, and avoids the need for an insulated extension rod for tuning.

The same connection has been used in the final stage. There are objections to the idea, as there is a fairly high circulating R.F. current involved, at least in the output circuit, and a good mica condenser is required to cope with it. However, in practice there appear to be no ill-effects resulting from what is undoubtedly a convenience.

The oscillator is coupled to the output stage through a fixed condenser of .00005 mfds., this being adequate to provide sufficient drive without loading the oscillator stage too heavily.

GRID LEAK BIAS

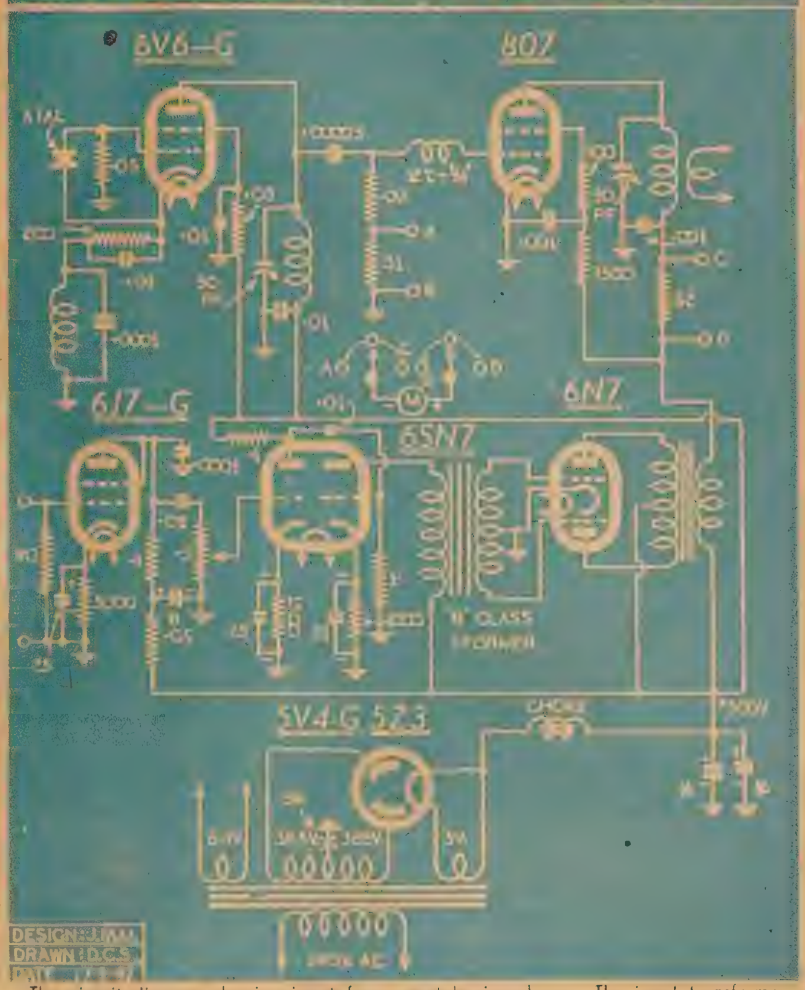
Grid leak bias is used for the 807, and we have not found any great advantage to result from other methods. There is a case for the inclusion of a cathode resistor and condenser to provide some of the bias, the main advantage being to limit the cathode current, should the oscillator cease to function, or the drive be removed for some reason. However, the total high tension we used was about 300 volts, and at this figure, the valve is not so liable to damage as it would be with higher voltage. And in any case, with a good crystal in the oscillator circuit, the danger of oscillation failure is not very great.

The grid bias is, of course, obtained by the rectification in the 807 grid circuit of the grid current. The greater the drive, the higher the grid current, which automatically causes a higher grid bias to be developed. This is one of the most attractive features of "grid leak" bias, and is the reason why considerable latitude can be allowed in the amount of grid drive which will give satisfactory results. The main point to watch is that the grid current is not normally higher than the makers specify. Apart from overheating the grid, the 807 is liable to be erratic in operation if over-driven.

As usual, the small grid suppressor choke appears in the grid circuit, in addition to a 100 ohm suppressor resistor in the screen circuit of the 807.

Without these two, there is a tendency for parasitic oscillations to oc-

2-STAGE TRANSMITTER CIRCUIT



The circuit diagram showing input for a crystal microphone. The input transformer needed for a dynamic microphone is shown in the under-chassis photograph.

cur with the 807, not only in this circuit, but in almost any other. So much so that these two suppressor components should be regarded as standard for any circuit using an 807 and especially where the valve is used as an amplifier.

The resistor is an ordinary ½ watt moulded type. The choke may be wound with wire about 20 gauge, having 12 turns and a diameter of an ordinary pencil. The little coil is stretched until the spacing between turns is about half the diameter of the wire.

In some cases, the valve will be

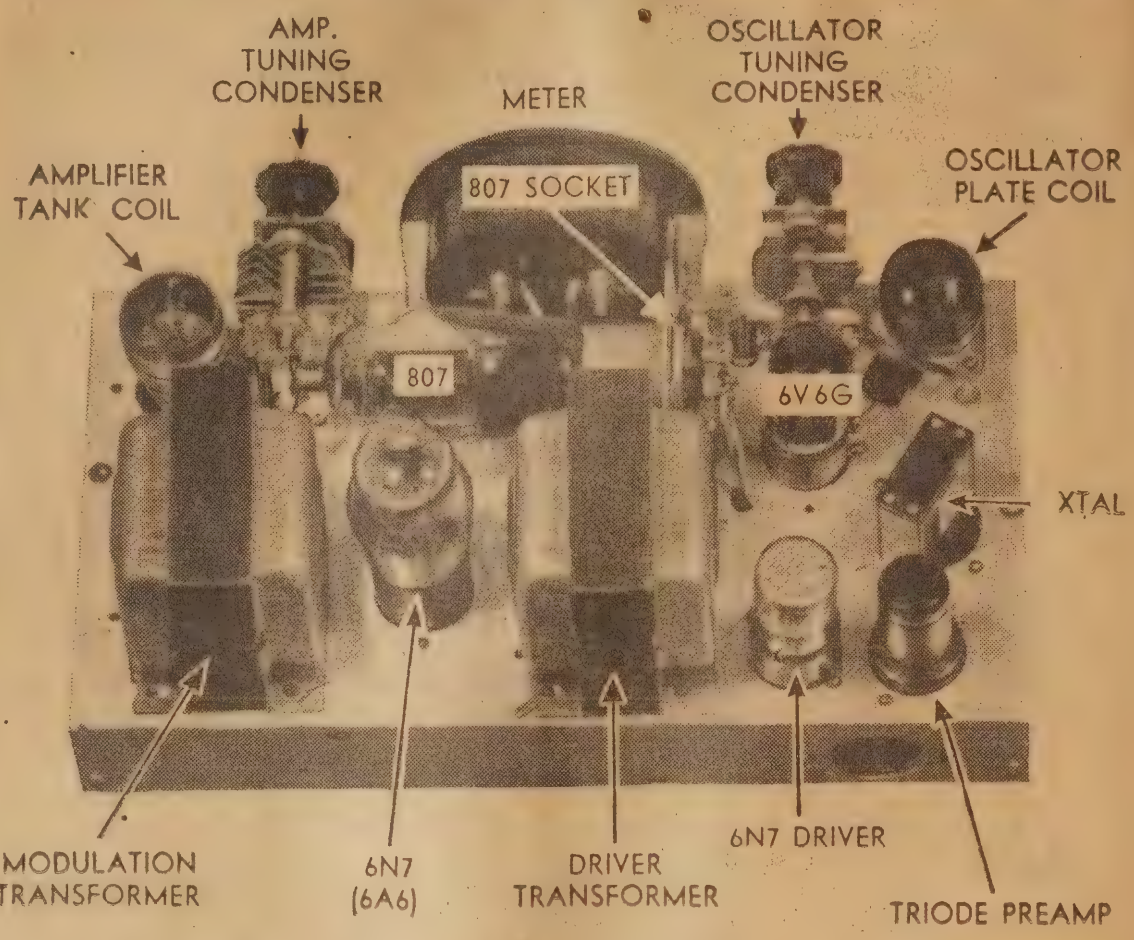
PARTS LIST

1 Chassis, 13" x 7" x 2".
2 Variable condensers 50 pf.
1 3-30 Air Dielectric trimmer.
1 50 pf. mica condenser.
2 100 pf. mica condenser.
1 .001 mfd. mica condenser.
6 .01 mfd. mica condenser.
1 .25 mfd. tubular cond.
3 .25 mfd. electrolytics.
1 7500 ohm W.W. 5W. Resistor.
2 1500 ohm W.W. Resistors.
1 200 ohm W.W. resistor.
1 .5 meg. resistor.
1 1 meg. resistor.
2 1 meg. resistors
3 .05 meg. resistors
1 .02 meg. resistor
1 5000 ohm resistor.
1 100 ohm resistor.
1 .5 meg. potentiometer.
1 "B" class input transformer.
1 Modulation Transformer (see text).
1 2 x 5 switch
Suitable crystal.
Sockets—4 octal, 5 5-pin.
Valves—6J7G, 6SN7GT, 6N7G 6V6G, 807.
5-pin valve bases (micalex) for coils

POWER SUPPLY

1 385v per side 150 m.a power transformer.
1 150 m.a. choke.
1 5V4G or 523 rectifier.
1 chassis 13" x 7" x 2".
1 on-off switch.
Sockets 5-pin, one to suit rectifier.
Hook-up wire, nuts, bolts, etc.

GENERAL VIEW OF THE TRANSMITTER LAYOUT



2—STAGE MULTIBAND TRANSMITTER—R & H FEB. 1947.

free from parasitics without the grid choke, depending on the screen suppressor resistor alone. It may be possible also to use fewer turns on the choke than the 12 we have specified. Experiment here is a good thing, as there is nothing to be gained by using a larger choke than is necessary to "tame" the valve. If you find 6 turns are enough, by all means use 6 turns.

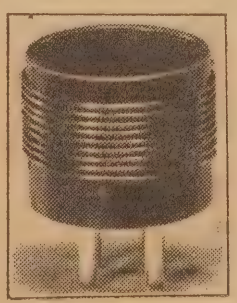
The screen voltage for the 807 is obtained from a dropping resistor of 7500 ohms, this being about the right value to give correct operating voltages consistent with best output at 300 volts high tension.

If the 807 is operated at higher plate voltage, the value of this screen resistor must be increased to keep the screen voltage down to ratings. We will have more to say about this point later on.

CURRENT METER

A meter is included, wired in such a manner that it can be switched from the 807 plate circuit to the grid circuit. Thus it measures the two most important current values.

In the case of the 6V6G, the valve



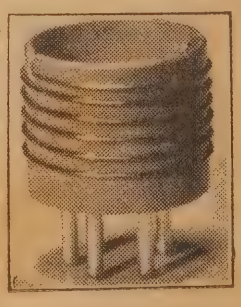
COIL DATA

6V6-20t, 807-22t. Wound on standard coil formers 7mc. spaced 2 inches.

14mc.
6V6-9t, 807-11t. Wound on valve bases, spaced $\frac{5}{8}$ inch.

28mc.
6V6-4t, 807-5$\frac{1}{2}$t. Wound on valve bases, spaced $\frac{5}{8}$ inches.

Wire used, 20 guage enamelled.



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will draw optimum current under almost any setting, and after a preliminary check has been made when the transmitter is first switched on, there is no great need to measure it again

However the 807 grid current must be known when changing from band to band in order to ensure that the 807 has adequate drive. Similarly the plate current must be known to ensure that the valve is properly loaded, and is giving its correct output.

The meter we used has a 0-1 mA reading, external shunts being automatically provided as it is switched from one circuit to another.

These shunts are simply small pieces of former wound with enough fine gauge insulated wire to give a reading of 0-6 mills in the grid circuit, and 0-100 mills for the plate circuit. In one of the circuits, we used a small carbon resistor which happened to be just the right value.

It is not necessary to use a 0-1 mA meter, of course. For instance, a 0-10 mA meter could be used without a shunt for reading grid current, and with a shunt to multiply the reading by 10 for plate mills. Other possibilities will suggest themselves according to the type of meter you may have available.

TRANSMITTER LAYOUT

Concerning the transmitter layout as against the modulator layout, the photographs will show that it occupies the front section of the chassis from left to right

The oscillator cathode coil is beneath the chassis with its .0001 mica condenser and small air-dielectric trimmer The valve itself is mounted immediately behind a small bracket which supports the 807 valve socket. The oscillator tank coil plugs into a socket in the front left hand corner and the tuning condenser is immediately to the right of it.

This layout allows quite short leads all round, and the coupling condenser, which drives the 807, is supported by its own two leads cut short. The little choke through which it connects to the 807 grid is quite easily seen in the photographs.

The grid terminal of the 807 socket faces the front of the chassis to allow the easiest of grid connections. Both the grid leak and the screen suppressor resistors are mounted right at the 807 socket with leads from them running through the chassis to appropriate points.

In order to keep the input and output circuits of the 807 well separated this valve lies on its side

The 807 tank circuit duplicates the 6V6G tank circuit as far as layout is concerned, thus making the chassis symmetrical in this respect. The lead from the 807 plate is only about 1 inch long, and other leads to the coil socket are correspondingly short

AERIAL COUPLING

This positioning of the coils makes it easy to change bands, and allows a coupling loop mounted on a panel to slide up and down over the 807 tank coil for aerial connection. This coupler isn't shown in the photographs, but it may be similar to that used in several transmitters described in recent months.

Alternatively a loop may be mounted directly on the valve base which comprises the coil former, and its ends connected to a couple of spare pins. The loop can then be pre-adjusted so that plugging in the coil automatically plugs in the aerial coupling loop, already adjusted in position for the band in use

Considerable thought was given to a modulator for the transmitter Remembering that the input was to be 15-20 watts, an audio output of about 10 watts was needed with the minimum of effort.

MODULATOR

In the A class field, another 807 seemed to be the only possibility and to get 10 watts from such a valve called for high plate and screen voltages, plus a very high standing plate current

But there is a simple type of audio amplifier, not used nearly as much as it deserves to be for small modulators That is the "B" class system using valves of the 6A6 type.

With 300 volts on the plate, and driven from a simple triode, such a valve will deliver 10 watts output. Its standing current is rated at about 40 mills, rising much higher of course on peaks

If a carbon microphone is used, it can be fed into the driver valve grid, and the full output obtained. With a hand dynamic mike used in this case, two extra stages of amplification are required

This isn't such a difficult job as it might seem. We used one half of a 6SN7GT as the driver, and the other half as a pre-amplifier. Then in order to make sure, we added another triode pre-amplifier ahead

Resistance coupling was used in these stages

Thus, according to the microphone used, the driver valve should be a 6SN7 type, which has a high gain, with the two sections connected in parallel if you like, while for a dynamic or crystal mike, one section should be used as a pre amplifier, with preferably a second pre-amp. ahead of it.

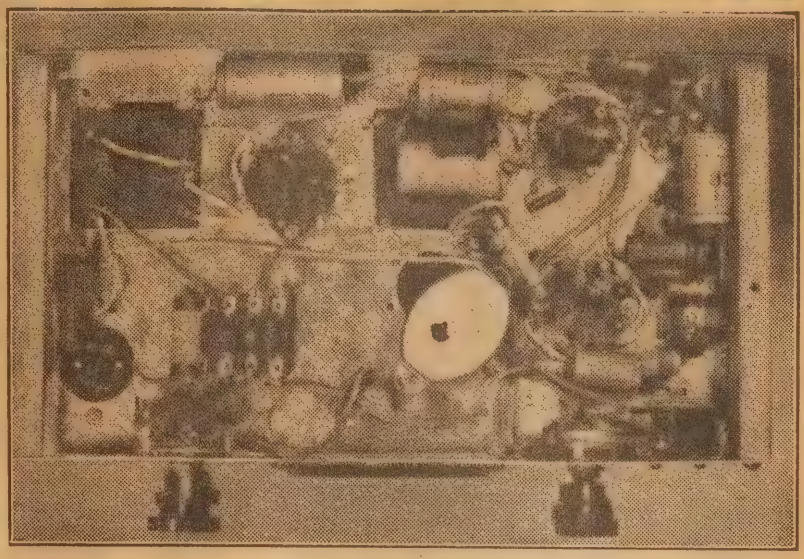
Indications are that with a good crystal microphone, this extra pre-amplifier may not be absolutely necessary, although we advise it if the full output from the modulator is required on normal speech.

REGULATION

The wide variation of plate current drawn by the 6N7G (or 6A6) calls for good regulation in the power supply

This is taken care of by the fact that the supply is already providing about 100 mills for the transmitter, and in addition, there is a large capacity used for filtering—32 mfds. in our case This helps greatly to supply

UNDERCHASSIS OF TRANSMITTER



This under-chassis picture shows that there is no undue crowding of parts. The microphone transformers is that white oval device near the centre.

AT present we are building up a small receiver on the power supply chassis of this transmitter. If it works out as well as we expect, details will be published in an early issue. It will use the same power unit as the transmitter, has four valves and plug-in coils.

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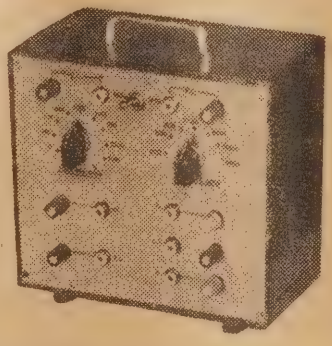

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the extra peak current needed on the voice peaks, and in practice, the final result is quite good.

Moreover, the power supply itself has choke input, and this again, assists materially in the regulation of the supply.

On measurement, the modulator supplied satisfactory output of 12.5 watts into a 12,000 ohms resistive load connected across the secondary of the output transformer, with a high-tension of 310 volts. This of course, was on a steady tone at 2000 cycles. It is sufficient to indicate that the modulator has ample power for the job. On voice, this output could be exceeded, although it is likely to vary with the characteristics of individual valves.

Incidentally, the frequency response of the modulator we found to be surprisingly good over the full audio range—good enough to handle music, although that isn't a requirement. It was approximately the same using an ordinary battery set type of B class input transformer, and a small power transformer as the modulation transformer.

MODULATION TRANSFORMER

On this point, we suggest that a standard 50 mill. power transformer having a secondary of 225 volts per side, using the secondary as the push-pull primary, will serve quite well. Its impedance ratio will be about 3.5—1. If the transmitter is run at 300 volts and about 70 or 80 mills plate current, this, together with the screen current, will give a load of about 4000 ohms. This means that the B class valve will be operating with something like 12,000 to 16,000 ohms from plate to plate. This is a good deal higher than that given by the makers for full output at low distortion, but a test showed no loss in audio power. Fidelity may suffer a little, but as we are dealing with voice alone, this doesn't seem to worry us very much.

If a special modulation transformer is to be wound, its ratio should be about 3—1 "step-down."

MICROPHONE INPUT

The input circuit will depend entirely on the type of microphone to be used.

If a crystal mike, a 5 meg. resistor straight across the input from grid to earth will be required. The volume control, incidentally, is wired in the grid circuit of the first half of the 6SN7.

If a dynamic mike is employed, a transformer is required, having a fairly high step-up ratio, as the impedance of the microphone is quite low. We used a transformer from an Army 101 transmitter originally used to feed low impedance headphones, although we obtained quite reasonable results from a 6.3 volt filament transformer with the 6.3 winding as the primary. A fair amount of latitude seems to be permissible here.

A carbon microphone will also require a transformer, in addition to 3 volts d.c. A small battery seems to be the simplest way out of this problem.

The power supply plugs into a socket at the rear of the chassis, and consists of a 6.3 volt source, and about 300 volts of D.C.

POWER SUPPLY

The a-c supply uses a receiver type transformer of 385 volts per side at 150 mills. A single filter choke is enough to give quite good filtering in conjunction with the large filter condenser capacity. The use of choke input will reduce the output voltage to just on 300 volts with a 5V4G rectifier, and much the same with a 5Z3.

We built our power supply on a chassis of the same size as that used for the transmitter. Keeping the components over to one side, there is enough room left to build a small receiver on the same chassis, which makes a most attractive layout for a compact, low-powered station.

OPERATION

The operation of the transmitter is a very simple matter. Although there are a fair number of small bits and pieces under the chassis, there is no need to cramp things, and as all the high value resistors are of the ½-watt type, they can be fitted in without very much trouble.

The oscillator section is first of all put into operation. Leave the 807 out of its socket, and test for output by using a single pick-up loop of insulated wire connected in series with a pea lamp.

With the crystal in place, and the oscillator tank condenser tuned to resonance, the lamp should burn quite brightly.

The cathode trimming condenser is adjusted until the best output is obtained from the pea lamp.

Now plug in the 807, and remove for the moment the high tension from both plate and screen, not plate only. When the 6V6G plate condenser is tuned to resonance, there should be the best part of 5 or 6 mils grid current showing, if not more than this.

Now connect the high tension to the 807 and switch on once more. Tune the final tank coil quickly to resonance, as the meter when switched across will read something like 100 mills or more out of resonance. This should drop to a comparatively low value when the circuit is tuned.

Connection of the aerial to the coupling loop will cause the plate current to rise, and may call for a slight readjustment of the tuning condenser. The aerial may be coupled until the plate current reads about 60 or 70 mills, which should be taken as more or less an optimum value.

COVERING THE BANDS

Assuming a 7 mc. crystal, the transmitter so far has been used mainly on the 14 and 28 mc bands. This means that the 6V6G operates as a doubler, and the 807 a straight amplifier.

There may be rather too much drive for the 807 on 14 mc. If so, the 6V6G plate circuit may be slightly detuned to reduce grid current to a maximum of 5 mills.

For 28 mc. we obtained best results by using the 6V6G as a quadrupler, with the best part of 2 mills grid current available for the 807, operating again as an amplifier.

It is possible to use the 807 as a doubler to 28mc. doubling also in the 6V6G. However, efficiency will be somewhat better by quadrupling with the 6V6G, and the crystal current should not be too high for a good "rock" so long as the oscillator high tension does not exceed 300 volts, and the value given for the screen dropping resistor is adhered to.

For 7 mc. operation, the cathode coil of the 6V6G should be shorted out, thus operating it as a straight oscillator. The 807 again amplifies at this frequency.

As only two pins of the oscillator plate coil are used, the others could be used to short out the cathode coil. The hot end of the coil should be connected to one of the free socket connections, and the second free socket, connection earthed. The corresponding pins on the coil former are connected together. Thus when the 7 mc. coil is plugged in, the cathode coil will automatically be shorted out.

The same idea could be used for 3.5 mc. operation, although it is doubtful whether enough turns could be wound on valve bases to cover the band. Plug-in formers could, of course, be used.

Our tuning condensers are of comparatively low capacity, but quite suitable for 14 and 28 mc. If the other bands are contemplated, 100 pf. condensers would probably be better, as with the smaller capacities, trouble might be experienced in striking resonance due to the rather small tuning range covered.

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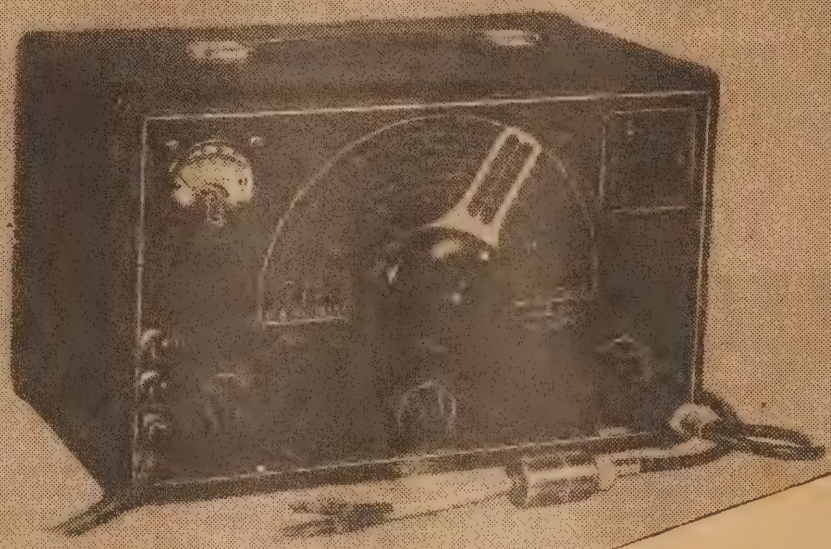
The Palec Modulated Oscillator

MODEL MO1



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The unit comprises a Colpitts oscillator covering the range 150 K. cs.-30 M. cs. in six direct reading bands. The coils are permeability tuned . . . Calibration accuracy 1% . . . Dial is a vernier type of 54:1 ratio . . . The output of the oscillator is fed to a cathode follower stage to overcome frequency modulation and attenuator reaction . . . 400 C.P.S. modulation is fixed at 30% . . . An unprecedented feature is the attenuator, a heavy cast machined unit of Signal Generator pattern which provides attenuation within ± 1 db in five steps with an impedance of 11 ohms on the lower settings . . . Triple shielding ensures leakage less than 1.0 microvolt at all frequencies . . . Approximate output voltage is from less than 1 to 100,000 microvolts . . . Power supply 210-270 volts A.C., 40-60 C.P.S. . . . Supplied complete with detachable dummy antenna, co-axial leads and 24-page instruction booklet. Dimensions: 14" x 8¾" x 8¼". Weight: 26 lbs.

Available in two models: MO and MO1, the latter having a built-in 3-range A.C. output meter for alignment purposes. External vibrator unit for battery operation extra. "Palec" Signal Generator Model S.G.1, as supplied to and used as standard production test units by leading radio manufacturers, also available.

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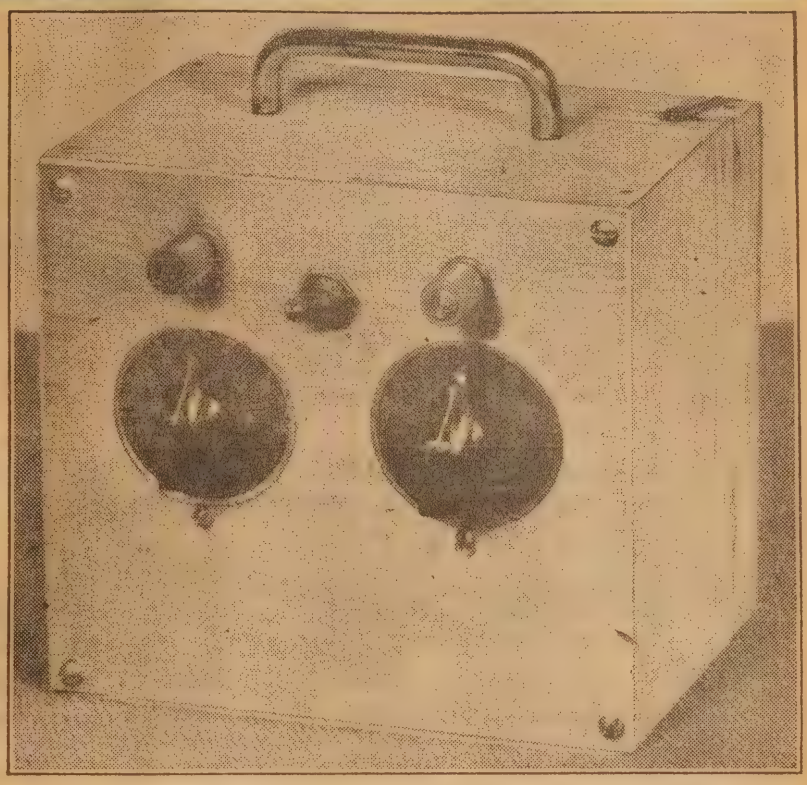
A BABY HEADPHONE PORTABLE SET

THE great success of our baby receivers, such as Little Jim 2, has encouraged us to think quite a bit about sets of this kind, of the performance one can expect from them, and of the various methods by which it can be obtained.

It is most encouraging to know that so many are building up what might well be considered "beginners' sets." The most successful and avid builder of the "big boys" all started out on their hobby in a small way, and it is pretty safe to say that the humble "detector and one audio" has been an early success of every one of them.

It would be hard to count back to the days when this type of set was first built. It would be something like 25 years. And we can make a guess that as far as we can see ahead, enthusiasts will still be building such receivers, and getting good results from them.



With a nickel-plated handle for carrying, Tex is a very neat little job.

LOOP AERIAL

It was while playing about with a couple of portable sets that we decided to try out a loop aerial with a two-valve circuit. It's probably not a very new idea—we remember not long ago one of our readers reported good results in a set we described in the "Reader Built It' section But like so many other good little stunts, the advantages of the idea didn't really impress until we tried it out for ourselves.

At first sight, the idea of a loop aerial with a reaction circuit might seem strange. But actually, there is nothing strange about it. When using a loop aerial, all we are doing is to wind the first coil of the receiver very much larger in diameter than is usually the case. Then, instead of shielding the coil so that it can't pick up unwanted energy from external sources, we leave it unshielded expressly so that it can pick up signals from radio stations In other words it is both tuning coil and aerial, all in one.

It is a very good picker-up of signals, mainly because, being tuned to the station's frequency, it is able to do a much better job than a length of wire which isn't Ideally, the loop should be as large as possible—a single turn of very large diameter, for instance, would pick up more energy But in practice we have to make a compromise. We wind the loop round the outside of the cabinet, and if more pick-up should be required for weak signals, an external aerial can be used to supplement the pick-up of the loop.

GOOD PICK UP

In practice, it is really amazing how strong signals can be, using the loop alone. It is quite directional with respect to the station being received, which is rather a handy characteristic should there be two strong stations placed so that their signals arrive at something like 90 degrees to each other Maybe you have already noted this effect with an ordinary portable set, and "tuned" the stations in and out merely by rotating the set with its in-built loop aerial.

The first query about the loop is likely to be "what about reaction" Well, what about it? If you remember that the loop is simply a tuning coil with a large diameter, you will realise that there is no reason why the reaction coil should not be of a diameter equally as large. In fact, it is probable that you will find reaction easier to handle with the loop type of aerial than with some types of standard coils. Moreover the large diameter is often advantageous from the point of view of efficiency. In this regard, the fact that the set itself is partly in the field of the loop doesn't appear to affect adversely the results.

Although this little set is complete as described, the general layout can be considered standard for almost any combination of battery valves. It is intended to be completely home built, and small modifications to cabinet size for instance can be made if your components allow. But if you depart from our sizes, make sure your chassis and cabinet fit together before wiring up.

SMALL SIZE

When building up Little Jim 2, we thought we had kept the chassis down pretty small in size. However the removal of the tuning coil from the base gave us enough room to make the new little set even smaller, and what is more, to get two valves on deck instead of one! This fact alone opens up some very interesting possibilities in valve combinations—so much so that almost any combination of battery valves, within reason, can be used with the same layout and battery supply.

Many radio beginners have a limited supply of valves—in many cases only one or two. Some of these may be 1.4 volt types, and others are bound to be 2 volt types. With a little care and thought, about the only limiting factor in putting these into use is the slight modification to circuit and hookup which may be required.

We will have a little more to say

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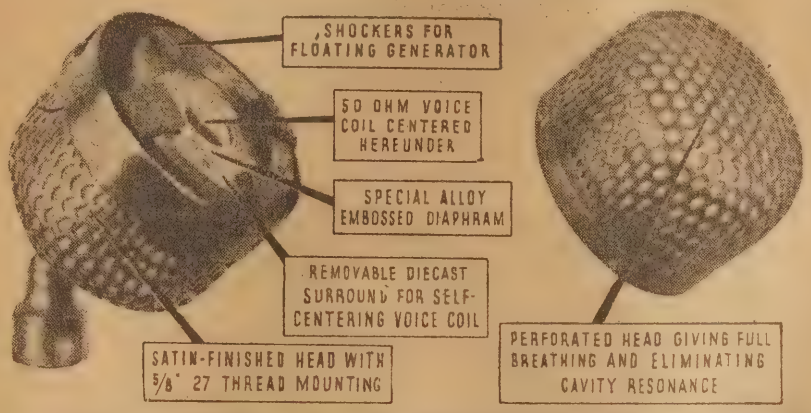
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about using various valves near the end of this article. In order to describe the set, we will assume it to use the 1P5 and the 1Q5, both 1.4 volt type valves.

The actual chassis is a flat metal plate measuring 5½ by 4½ inches. We bolted this to the front panel with a couple of brackets, the size of the panel being 5¾ by 6¼ inches.

CABINET

With a small cabinet made of 3-8 inch wood, the set should slide in with quite a tight fit. It might be a good idea to make the front panel another ¼ inch wider than ours, which will make sure there is plenty of clearance, no matter what type of components are used. The point most likely to foul the inside of the cabinet is the rotor of the tuning condenser. However, it would be an easy matter to cut away a little of the wood should the need arise.

There may be some virtue, too, in making the cabinet so that the edges of the chassis slide into a couple of saw cuts in the wood. It isn't essential, but it does help to make an extra firm job, particularly as the batteries are immediately underneath.

Concerning the cabinet, we are suggesting that as it is so small and simple, you should knock it up yourself. The fact that the loop aerial is wound round the outside makes it a little difficult for cabinet manufacturers to tackle the job, although of course it is by no means certain that they will not do so. The dimensions we will give them will be for a panel ¼ inch wider than the one actually used in our set.

LAYOUT

Concerning chassis layout, this is pretty well covered by the illustrations. It is somewhat similar to that of Little Jim 2, except that the detector valve is mounted in place of the tuning coil.

Remember to use counter-sunk bolts when fastening to the chassis. Round-headed bolts will almost certainly foul the batteries beneath, and will be a constant source of bother, unless filed down until the heads are almost flat.

The valve sockets are standard wafer type, supported just high enough for the connections to clear the chassis and avoid short circuits. The tuning condenser may be supported by standard mounting feet, or by small metal brackets if the others are not available. The reaction condenser is of course, mounted directly to the metal panel.

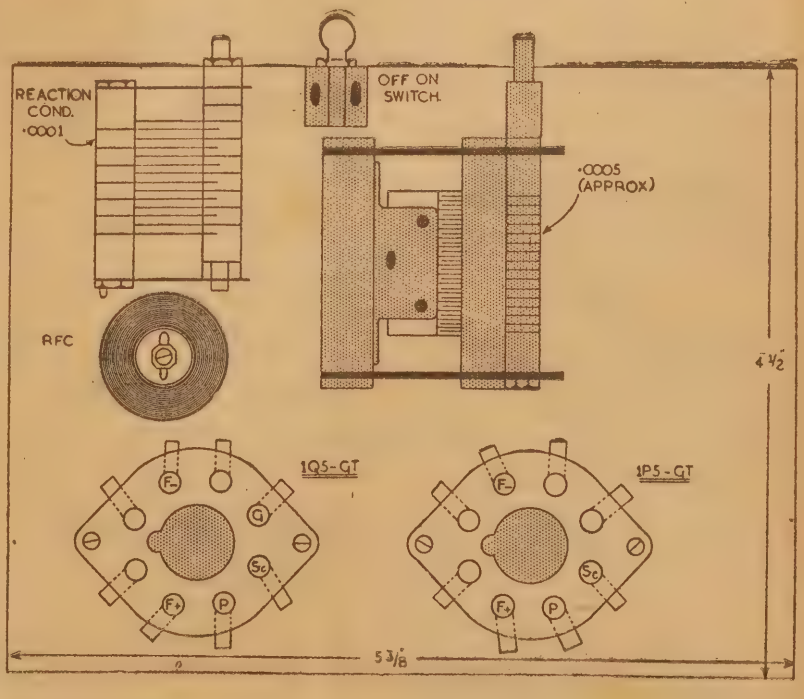
DETECTOR

The circuit we have used employs a screen-grid detector, resistance coupled to a beam-power output valve, the 1Q5. This combination is about the best for overall gain and highest output.

Because of the comparatively low high tension voltage of 67½ volts, we used condenser reaction as against, for instance, varying the screen voltage of the detector. The difficulty with this latter scheme is to strike a balance between reaction over the full band and enough screen voltage

REAR VIEW OF SET CHASSIS

This picture shows the layout of components.



The above illustration drawn to scale, shows how the main components are laid out on the chassis. The job of drawing a full wiring diagram is rather difficult if clarity is to be preserved, but the connections are so simple that even the novice should be able to work them out. This layout may be considered suitable for practically any combination of battery valves.

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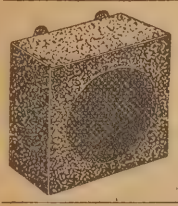

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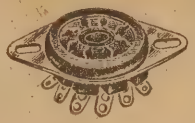

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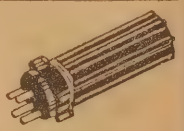

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to give highest gain. In most cases this isn't as easy as it may seem. It's not much use having a nice smooth reaction if to get it, the screen voltage must be reduced too low, particularly if there is an alternative method which gives good reaction control at fixed voltages.

As a matter of fact, very little difference will be found by running the screen and plate of the detector at the full high tension of 67½ volts. If there is any difference, however, it will be an improvement to reduce the screen voltage slightly, and the 50,000 ohms resistor will be found just about right in this regard.

The 1Q5 requires some bias at 67½ volts, and to avoid using a bias battery, we have employed a back-bias circuit to give the few volts necessary. The actual value is so small that its subtraction from the effective total high tension is negligible as far as results are concerned.

Otherwise there is nothing out of the way about the circuit, particularly as we were anxious to make it entirely suitable for use with various standard types of valves which might not work in conjunction with trick circuits.

Do not imagine that you will have any trouble in winding the loop aerial. It is no harder than winding up any other tuning coil on a smaller former. Even if you don't get the number of turns right first time, assuming you have to use wire of a gauge different from that of ours, it is very easy to add or remove turns until either the tuning range is OK or the reaction just right.

WIRE SIZE

We happened to have some silk-covered wire of 30 gauge on hand, which is a nice handy size. But you will do quite well with anything between about 24 and 32 gauge. Heavier wire will become awkward to handle, and finer wire is liable to kink and break in a most exasperating manner. Enamel or cotton-covered wire will be OK, with a preference for the enamel.

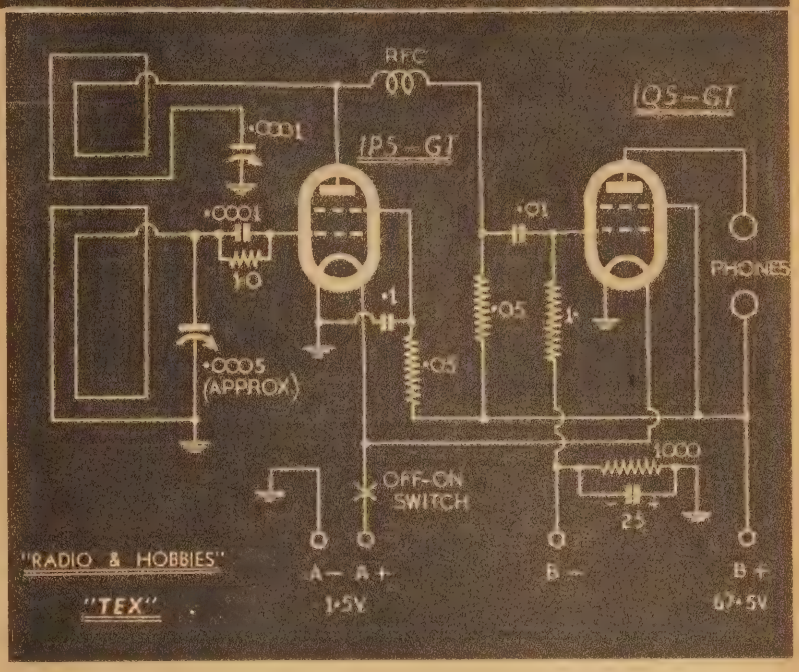
Our loop contained 24 turns for the tuning coil, and 10 turns for the reaction. A space of about ⅛-inch was allowed between the two windings. We wound the wire on "flat," with no attempt to space turns.

The ends of each winding were wound round the head of small brads tapped through the wood, and held firmly with a spot of solder. The connections to the set were made by soldering short lengths of thin flex to the points of the brads where they appeared through the wood inside the cabinet. It is rather important that the ends of the wires should be firmly held, as it is desirable that the loop windings should not move about after they have been wound in place.

In order to provide tappings for outside aerial connection, we bared the wire at the 5, 10, and 15th turns of the grid winding, and soldered lengths of the same wire to them, the free ends being connected to three sockets mounted on the back of the wooden cabinet. An auxiliary aerial of about 30 feet terminating in a plug can then be carried as an extra, to be used with the free end strung up to some high spot if the pick-up from the loop should not be sufficient. This might be the case if the set is operated some distance from broadcasting stations

If you use heavier gauge wire, you will probably need a few more turns than the number given and, if the wire is finer, a few less. As we have said, it is a simple matter to experiment in this regard. The actual spacing of wire on the cabinet will also affect the exact number of turns, which, however, should not vary from those specified by more than perhaps three or four.

CIRCUIT DIAGRAM IS SIMPLE



VALVES

Although the valves we specify present possibly the best combination, it would be possible to use a triode detector in place of the 1P5, and another triode in place of the 1Q5, with somewhat reduced volume. If triodes were used, they would probably be of the 2-volt types, but on reduced high tension, the reduction of the filament voltage to 1.5 volts would not seriously affect performance. The same would probably be true of the 2-volt equivalents of the 1P5 and the 1Q5. There would be no need to alter circuit constants. With a triode detector, the screen connection would be ignored, and of course, the grid connection would be on the socket itself, and not via a grid cap, except in the case of the 1H5, which has diodes as well. These would not be used.

The use of duo-triode such as the 19 would also be quite in order. In this case. Only one socket would be needed, as the two sections of the valve are of course in one envelope.

We mention these possibilities to instance what can be done if you wish to improvise on the basic circuit and layout, either to use up valves you have, or for your own amusement. Any combination of two valves should be able to give you good headphone strength, and if our combination is adhered to, reasonable speaker results on strong stations.

BATTERY DRAIN

The total high tension current in all cases will be very small. In our case it worked out at 4 mills, and

PARTS LIST

- 1 Panel—6½" x 5¾"
- 1 Chassis—5⅜" x 4½".
- 1 Cabinet—6½" x 5¾" x 4⅞" outside measurements. Material ⅜" thick.
- 1 Single gang condenser .0005 mfds. app.
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this would probably be the highest registered by any combination.

The batteries are one 67½-volt Minimax for the B battery and three heavy duty torch cells connected in parellel for the A Battery. The B battery should be capable of outliving several sets of A batteries, and the latter should give quite good life, depending of course on how much the set is used.

There will be a number of questions which you will want to ask about the cabinet and its finish, particularly as there is a loop aerial wound round it.

FIXING THE LOOP

The best way to do the job, after the cabinet itself has been fastened together with small nails, and glued for strength, is to cut a shallow channel large enough to take the wire you will use for the loop, and allow this wire to lie flush with the outside diameter of the cabinet itself.

This is not a hard job, if you have a sharp chisel. When the channel has been cut out, it can easily be cleaned up with a little sandpaper.

After the loop has been wound, it is a good thing to fix it in place so that it can't move about, or be subject to misplaced turns. A coating of "coil dope" is quite a help here, or some kind of duco cement, which is not likely to upset the insulation or dissolve the enamelled coating.

When this is dry, the cabinet may be covered with leatherette, for instance, which will give it quite a professional appearance. You will find that if you have taken a little care over cutting the channel for the loop, the leatherette will lie quite flat over the cabinet, without any noticeable indication that the winding is there at all.

If the wire is covered with the coil dope, there is little chance of the glue upsetting the characteristics of the winding, although, even without the dope, this isn't likely to be a serious consideration.

AERIAL SOCKETS

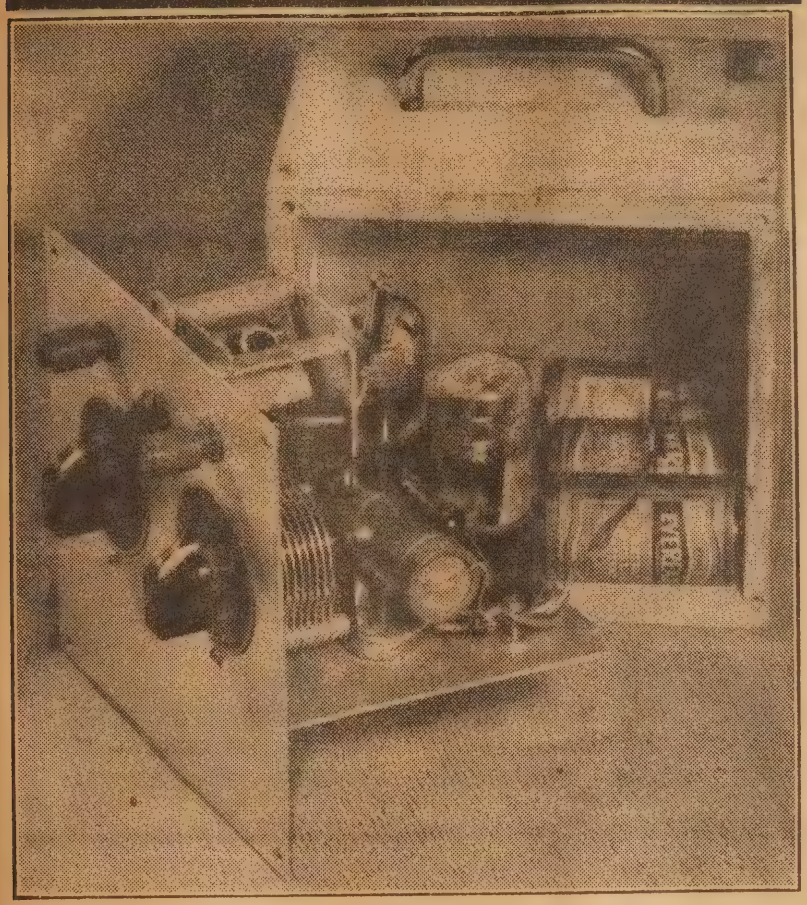
The sockets for external aerial connection may be mounted on the back of the cabinet after it has been covered, and the leads to the tapping either soldered to lugs screwed down with the sockets, or the bared wire simply wound round the socket shank, and the whole thing tightened up, taking care not to break the wire.

Connection to the grid and reaction circuit of the set can be made with light gauge flex, twisted together just tightly enough to prevent it unravelling when the set is pushed into the cabinet.

It is a good idea to bind the beginning and end of these twisted leads with a few turns of cotton to prevent this happening. The "slack" should be just long enough to allow the set to be slid out of the cabinet for battery renewal.

We brought the grid connections out from one side of the inner cabinet, and the reaction coil leads from the other. If you use two different colors for the

SET RESTS ON BATTERIES



This photograph shows how the chassis fits in its cabinet. The "A" batteries are visible inside—the "B" battery is obscured.

opposite ends of the windings, you will avoid mixing them up, and connecting either winding the wrong way round.

The extra aerial sockets will allow either a short extra aerial to be plugged in, or a longer one. The shorter aerial will probably work best from the 20 turn or 15 turn tap, while the long outdoor aerial will probably give best results on the 10 turn tap. If an aerial is tapped too far up the coil, band coverage and selectivity will not be of the best. Experiment is the best way of finding out which tapping is most suitable.

HEADPHONES

The best headphones to use will be the standard 2000 ohms type. There are, however, a large number of ex-Army headphones available for approximately 10/- from various stores These, although of much lower impedance, give quite good results. Less volume, and possibly tone, will be the main difference you will notice, but it won't be as bad as you might think. If you are lucky enough to come across one of the matching transformers made for such a pair of phones, you will find reception to be just as good as with the higher resistance types. If you are lucky enough to strike a pair of dynamic type phones and their transformer, you will be surprised just how well the set sounds.

It is quite permissible to operate the set "upside-down," which will bring the headphone terminals to the bottom instead of the top. Otherwise, the cords may get in the way when operating the controls. The batteries, even if they do move about slightly in their compartment, cannot come to any harm, and no detrimental effects will be noticed concerning the valves themselves.

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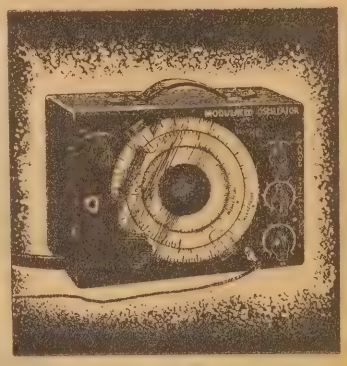

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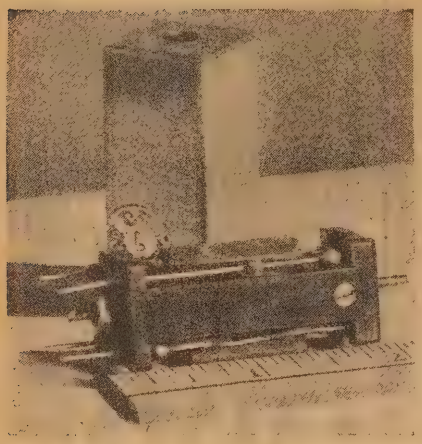

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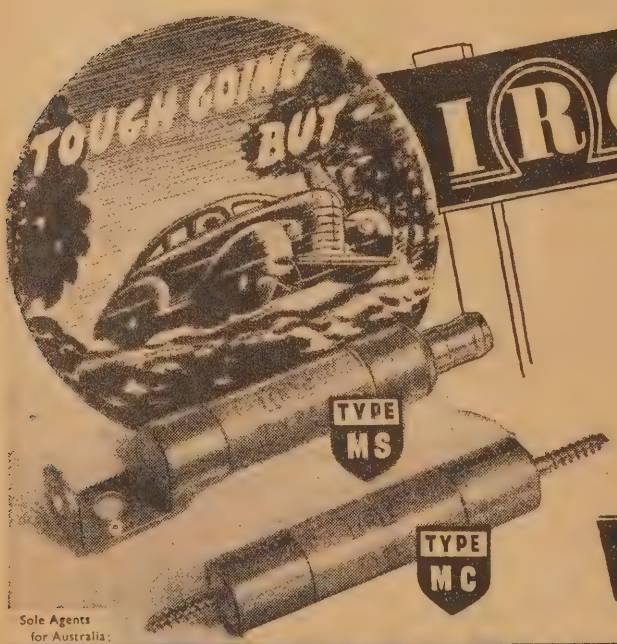

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THE X-RAY IN OVERALLS

So much emphasis is placed upon the use of X-rays in medical diagnosis and therapy that one is inclined to under-estimate the application of this branch of science in other fields. National defence, industry, architecture, and even art—each owes a debt to X-ray, and it is safe to assume that during these postwar years of development X-ray will become inextricably woven into the industrial pattern.

As wartime secrets are gradually released, it becomes clear that X-rays were a vital weapon in the hands of our scientists and manufacturers. In fact, it is impossible to limit their application to one aspect. They were used in the search for the sulpha drugs, DDT and penicillin . . . in the race for the atom bomb . . . welding was examined and certified before warships left the slips . . . light alloy castings, proven strain-free by X-ray, enabled the horsepower of aircraft motors to be increased.

Everywhere, whether in the production of artillery or synthetic rubber, in the making of armor-piercing shells or in the science of ballistics, one finds evidence of the rays which Wilhelm Conrad Roentgen discovered fifty years ago.

VOICE OF ROENTGEN

Of striking significance, when one considers the almost universal use of X-ray in wartime, is the fact that a decade before Hitler assumed dictatorship, the voice of Roentgen was raised in warning against the rising evil. Together with that of other far-sighted men, his prophecy was ignored.

In engineering alone, the X-ray has proved its worth over and over again. It is now an accepted process for metal and alloy castings to be examined for flaws and cracks. Formerly, the accuracy and strength of a weld was a matter of conjecture; the only way to check a weld was, paradoxically, to destroy it for examination. Today, radiography gives indisputable proof.

Yes, the ray is busy at work. It tests the quality of motor tyres and laminated wood. Customs officials "look into" mysterious sealed packages. Salesmen gauge the fit of customers' shoes. Jewel dealers can distinguish the spurious pearl or diamond when all other tests fail. We find it in the food factory, searching out any contaminated canned goods, and differentiating between juicy fruits and those whose plup is dry and useless.

To say that X-rays are used from surgery to plumbing may sound an exaggeration, but many plumbers and builders find that the rays help locate pipes and wires that otherwise could be traced only by extensive demolition. The timely ray-inspection of its wooden beams has saved from destruction many a priceless old English home or guild-hall.

Alert art museums are installing X-ray laboratories. In this instance, several interesting discoveries have recently been made. Some four hundred years ago a painter named Cornelius Engelbrechtsen apparently became dissatisfied with his painting of a monk, so he superimposed the figure of a woman.

This original painting would have remained undiscovered were it not for the penetrating eye of the X-ray. By the same method, another painter was shown to have removed an entire figure from one canvas. Yet another artistic "interloper" is the well-known figure of Reynold's "Blue Boy." In certain lights a peculiar whiteness could be seen behind the Boy's head. Investigations reveal the underlying figure of a man, and his white shirt accounts for the strange effect.

It must be provoking to art enthusiasts to know that such a canvas may contain another masterpiece, and that it is lost to them, perhaps by the painter's whim or simply due to his inability to purchase adequate materials.

When the news of Roentgen's discovery fired the world headlines in the New Year of 1896, he little realised, despite his remarkable foresight, that the subsequent history of his ray would follow a dual course—in medicine and in industry.

—From Philips Bulletin.

REDUCING INTERFERENCE

FLUORESCENT lighting interference with radio reception may be greatly reduced with a simple piece of screenwire, Dr. L. F. Shorey of the University of Vermont declared last month.

Speaking before the Illuminating Engineering Society in its convention at Quebec, Dr. Shorey, together with S. M. Gray, of Sylvania Electric Products, Inc., presented a study of radio interference caused by fluorescent lamps in the home. Their report discusses how such interference is measured and reduced below a tolerable noise level.

Total interference, they said, results from three sources; feedback through the wires of the house circuit; radiation of the high-frequency current components from the wires, and radiation coming directly from the lamps.

Line feedback is reduced by the use of an electrical filter, while bulb radiation interference is reduced by the application of a wire-mash screen *built into the lamp shade.*

"By a proper combination of these two schemes," they declared, "total interference is suppressed to a quite satisfactory level even with small distances separating the lamp and receiver antenna."

WORKING OUT VALVE TYPE NUMBERS

VALVE type numbers are often a source of confusion for less experienced enthusiasts, and the following brief explanation should be of assistance.

When metal valves were first envisaged in the US valve manufacturers agreed upon the use of the octal base and a new system of valve numbering. Thus, metal valves appeared with type numbers like 6J7, 6K7, 6V6, &c.

Subsequently manufacturers decided to release valves with the same octal base and characteristics as the metal types, but using conventional glass instead of metal construction. These valves were given the same type numbers as the metal counterpart, but with the suffix "-G," so that we have 6J7-G, 6K7-G, 6V6-G, &c. The metal and glass valves are interchangeable except for their obvious physical differences.

Following the trend towards miniaturisation, many of the "-G" valves were redesigned mechanically and fitted into the "-GT" glass envelope. These "-GT" valves—6J7-GT, 6K7-GT, 6V6-GT, &c—are now being released on the Australian market and will be used extensively in new seasons receivers. The electrical characteristics and base connections remain unchanged from the original metal and glass types, but there are the obvious physical differences.

Now a new series of type numbers is appearing, with the letter "S" inserted in the normal designation, viz. 6SJ7-GT, 6SK7-GT, &c. The insertion of the letter "S" indicates that the valve has been redesigned to eliminate the top cap, where previously used, and to bring all connections out to base pins.

But there is an important point to note. These single-ended valves are not identical with the earlier types, generally showing higher transconductance and, of course, different base connections. Some are quite different, as for example the 6N7 and 6SN7. Characteristics should be checked before using these single-ended types.

COST OF RADAR

COST OF RADAR research and development was greater than that of the atom bomb states a booklet issued by Wesley W. Stout, former editor of *The Saturday Evening Post.*

According to Mr. Stout, 2,700,000,000 dollars worth of radar equipment had been delivered to the services up to July, 1945, while the most of the atom-bomb is given as around 2,000,000,000 dollars.

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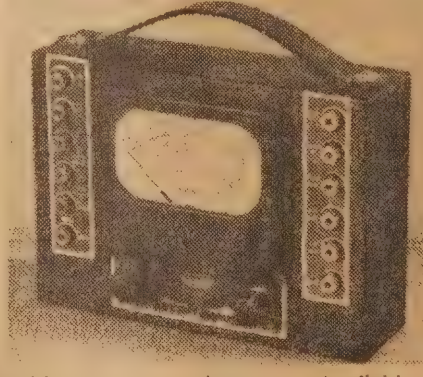

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THE COLOUR CODING OF RESISTORS

Most resistors in use in Australia are color coded according to the system adopted by the Radio Manufacturers Association (USA). At the request of many readers, the basis of this code is explained below.

SEPARATE colors are used to represent the numerals 0-9, and the color combinations are used to express the resistance value directly in ohms. The colors have the following significance: black 0, brown 1, red 2, orange 3, yellow 4, green 5, blue 6, violet 7, grey 8, white 9.

The first figure in the resistance value is represented by the body color Thus, if the main body of a resistor is red, it follows that the first figure in the resistance value must be "2."

The second figure in the resistance value is shown by the end color. The significance of the individual color remains unaltered so that, if our previously mentioned red resistor has a green end, the first two significant figures would be "25."

COLOR DOT OR BAND

The color dot or band at the centre of the resistor shows the number of noughts which have to be added after the first two significant figures.

A black dot would indicate no noughts and therefore the resistance value would be merely 25 ohms. With a brown dot, the resistance value would be 2-5-0 or 250 ohms. In the case of a 2500 ohm resistor, the dot would obviously have to be red, and so would not be apparent on the red body. Hence, if no dot is apparent, it can be assumed that the color of the dot is the same as that of the body.

By way of example, one may encounter a red resistor with a black end. Referring back to the list, the first two significant figures must be "20". The dot must be assumed to be of the same color as the body . . . red. This signifies two noughts, so that the value becomes 2-0-00, equals 2000 ohms.

ANOTHER EXAMPLE

To take another popular example, a green resistor with black end and yellow dot or band is 5-0-0000 equals 500,000 ohms or 0.5 megohm.

It will be apparent that the coding system does not lend itself to resistance values requiring more than two significant figures ahead of the ciphers.

The accompanying table sets out the colors and figures in a form which simplifies the transfer from color code to resistance value and vice versa. The second table shows the color codes directly for a selection of popular resistance values.

To simplify production, a few resistors from overseas sources are color coded in a somewhat different manner.

Instead of being applied to body, end and band, the significant colors are applied as three parallel bands around the resistor and towards one end. The body color of the resistor has no significance whatever.

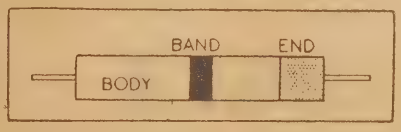
Hold the resistor so that the color bands are towards the left and read off the colors from the left to right. The colors have the same significance as before, so that no difficulty should be encountered on this score.

Assuming that the color bands on a resistor were, left to right, red, green and yellow, the resistance value would be 2-5-0000, or 250,000 ohms. Occasionally a fourth band is added, on the right, of either silver or gold. A silver band signifies that the resistance value is within 10 per cent. of the marked value, while a gold band indicates a five per cent. tolerance.

The use of color bands instead of body, end and dot colors should occasion no confusion, provided you remember to hold the resistor with the bands toward the left and read off the colors from left to right.

TABLE SHOWING POPULAR SIZES OF RESISTORS IN THE R.M.A. CODE

Resistance in Ohms	Body Color	End Color	Dot Color
2000	Red	Black	Red
5000	Green	Black	Red
10,000	Brown	Black	Orange
12,000	Brown	Red	Orange
15,000	Brown	Green	Orange
20,000	Red	Black	Orange
25,000	Red	Green	Orange
30,000	Orange	Black	Orange
35,000	Orange	Green	Orange
50,000	Green	Black	Orange
70,000	Violet	Black	Orange
75,000	Violet	Green	Orange
100,000	Brown	Black	Yellow
150,000	Brown	Green	Yellow
200,000	Red	Black	Yellow
250,000	Red	Green	Yellow
500,000	Green	Black	Yellow
750,000	Violet	Green	Yellow
1 megohm	Brown	Black	Green
1½ megohms	Brown	Green	Green
2 megohms	Red	Black	Green
5 megohms	Green	Black	Green
10 megohms	Brown	Black	Blue



BOOK REVIEW

"HOW TO BUILD TRAILERS," By John D. Porter. Paper cover, 128 pages, price 3/- plus postage.

With a return to more normal touring conditions, one can expect to see an increasing number of caravans on Australian highways. This new book by Porter should be welcomed by intending caravan constructors, for it contains many suggestions, plans and details not readily available from other sources. It should be a handy guide, too, for those who plan to buy a caravan but are not quite sure about the features which should be checked.

CARAVAN PLANS

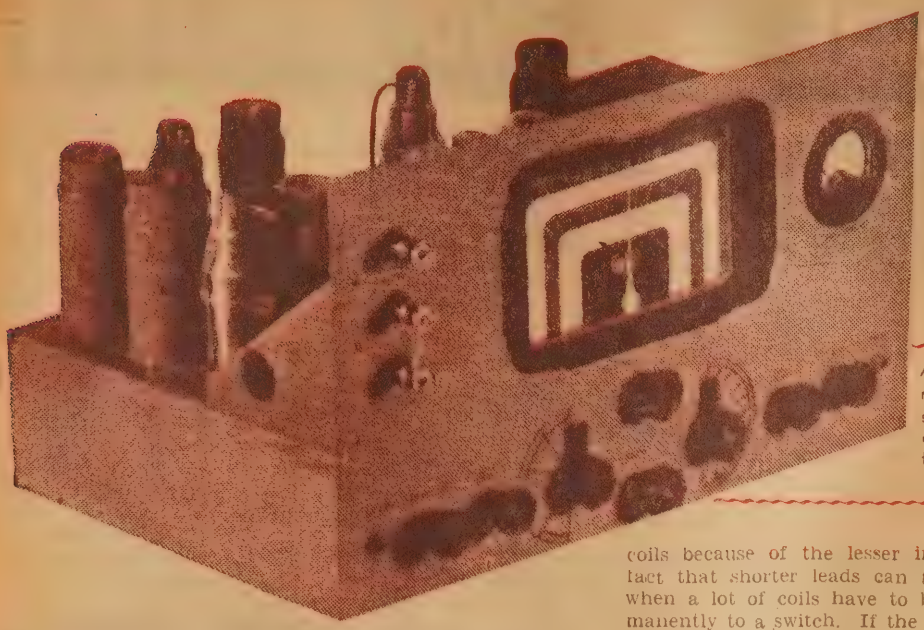
The book contains plans of three typical caravan designs, data on weight distribution, undercarriage design, tyre pressure, plus a wealth of other information on the subject. It discusses, for example, running water systems, parking legs, roofing, lean-to fixtures, the cooker, utensils, fittings and so on.

We're not convinced by the battery wind-charger design or the classic statement that "red blankets are warmer than white ones." But these are relatively minor points. Our copy from McGill's Agency, 183-5 Elizabeth-st., Melbourne.

R.M.A. RESISTOR COLOR CODE — **Values in Ohms.**

Body Color	First Digit	End Color	Second Digit	Dot Color	Remaining Digit
Black	0	Black	0	Black	-
Brown	1	Brown	1	Brown	0
Red	2	Red	2	Red	00
Orange	3	Orange	3	Orange	000
Yellow	4	Yellow	4	Yellow	0000
Green	5	Green	5	Green	00,000
Blue	6	Blue	6	Blue	000,000
Violet	7	Violet	7	Violet	0,000,000
Grey	8	Grey	8	Grey	00,000,000
White	9	White	9	White	000,000,000

A New



A front view of the new receiver. The panel is of sheet steel finished in grey enamel. Layout of the controls is symmetrical.

by W. N. Williams

DESIGNING a big amateur set, in some ways, is rather like drawing up the plans for a new house. Certain features are common to all houses, but no two of them ever seem to be exactly the same. Cost, location, materials available and the owner's personal ideas, all play their part in lending variation to the final result.

For this reason, we approached the design of our big short-wave set from a rather different angle to that normally adopted. With a set like the Little General we deliberately try and arrange matters so that each constructor can duplicate the original model, thereby giving some guarantee of its final performance.

But a big set for amateurs is a different proposition. Very few would desire—or be able—to visit a radio store with the list of parts and in "cold blood" collect and pay for the lot. On the contrary, there is the inevitable tendency to search the "shack" for every item likely to be of use in the new set.

That unused tuning gang, those odd valves, that set of I.F. transformers and, last but not least, all those sundry bits and pieces which have found their way from military disposals to the private junk-box.

Using up oddment parts like this can reduce greatly the cost of building a big set—and our own experimental model is no exception to the rule. It is ultimately destined for use in the writer's station and many of the parts will be recognisable as having come from dismantled military equipment.

While the tendency to use oddment components is understandable it does mean that considerable variation will occur between our experimental model and the sets which are based upon it. This is at least in keeping with the spirit of the amateur and, allowing for the fact that some technical knowledge can be pre-supposed, no undue difficulties should arise from small changes to the circuit and layout.

PRELIMINARY DISCUSSION

The set emerged in its present form after a lot of careful thought and many a discussion over morning tea with Editor John Moyle. Most debatable point is undoubtedly the system of tuning which should be employed in a set of this kind. The various possibilities were surveyed in a preliminary article a couple of months ago, and there is no need to repeat the discussion here.

Sufficient to say that John rather leans to plug-in coils because of the lesser initial complication and the fact that shorter leads can generally be arranged than when a lot of coils have to be mounted and wired permanently to a switch. If the coils can be grouped to plug in as a unit for each band, so much the better. Unless we miss our guess, another 2JU special will ultimately make its appearance embodying those ideas.

However, while admitting these good points, the writer has a personal preference for a switched coil set. It means a lot of careful thought and plenty of work and patience to get all the coils wound, installed and tracking accurately. But once the job is done there is no argument about the convenience of the finished receiver.

USES SWITCHED COILS

We quite realise that readers will similarly be divided in their ideas about the matter. But a decision had to be made in respect to this set and—well it has switched coils, separate trimmers, padders and all the necessary to permit accurate pre-alignment on each band.

Now for the matter of tuning. Here again there is room for a variety of personal opinion, but the writer dislikes the idea of having a big set available which is incapable of receiving any but amateur stations. So nice on occasions to swing the controls a little, and, without fuss, to tune in an overseas broadcast for some pleasant music.

Admittedly, this feature should not compromise the usefulness of the set for purely amateur band use, but our solution to the problem is a convenient one.

The coils so far wound resonate just on the high frequency side of the main amateur bands with the tuning condensers right out of mesh. Thus, the amateur bands are tuned with a favorable L/C ratio and just about in the spot where the trimmer condensers are peaked. Any losses which might occur due to poorer L/C ratio or to poor tracking do not affect the amateur band reception.

The coils are tuned initially by a three-gang condenser mounted beneath the chassis and having a capacitance of about 250 mmfd.—we did not measure it exactly. Actually, it is a three-gang AWA type from a disposals transceiver having eight moving and seven fixed plates per section. This condenser gives a tuning ratio of just under 2½:1 on each band.

The actual tuning ranges are shown on the coil data panel. However, the highest frequency range starts at 31 megacycles and extends to 9.7 megacycles. That is, from 9.7 to 26 metres. The next range covers from approximately 18 to 45 metres, while the third covers from 40 to just over 100 metres. Thus, the 10, 20 and 40

SHORT WAVE RECEIVER

Here is the set we have been promising for quite some time now. Designed and described by the Technical Editor, it should meet admirably the needs of the advanced Amateur and the keen short-wave listener. Bandswitching, bandspread, variable AVC, noise limiting, BFO stage and a variety of other features make this one of the most advanced receivers we have ever described. Even if you don't follow our design to the letter, you will find plenty of data in the circuit and descriptive article.

metre bands are all tuned with the condenser well out of mesh.

With a coverage of 2½:1, the tuning of this condenser is naturally fairly sharp. However, this is no problem provided it is operated in conjunction with a good vernier dial and an accurate reference scale. This condenser is used purely as a band setcontrol.

BANDSPREAD CONDENSER

Bandspread tuning is provided by a second three-gang condenser, mounted atop the chassis and operated by the main tuning dial. The one used in our set has three double-spaced sections with six moving and five fixed plates in each. The maximum capacitance per section would approximate 100 mmfd.

Were this condenser simply to be connected in parallel with the bandset unit, the minimum circuit capacitance of switch, condensers, trimmers, wiring, coils, &c., might have been excessive and we chose the alternative of connecting the bandspread condenser across only portion of the coil. This means a tapping on each coil and an extra switch section, but the complication was considered worth while.

The position of the tappings on the respective coils gives adequate bandspread with the 100 mmfd. condenser, but it can be varied if necessary. The nearer the tapping is to the earthed end of the coil, the greater will be the vernier effect afforded. For the higher frequency coils, particularly, do not break the continuity of the winding to effect the tapping. Wind the coil in the normal way, punch a hole in the former where necessary, scrape the wire carefully and solder a fine lead to it for connection to the switch.

The positions for the tappings were determined experimentally to give adequate spread on the 10, 20, and 40 metre bands, as tuned with the bandset condenser nearly out of mesh. At the low frequency end of each band, where the bandset condenser is nearly meshed, the bandspread condenser has a progressively smaller effect on the tuning circuits.

If you are prepared to sacrifice full frequency coverage, the bandset condenser can be reduced in capacitance to 100 odd mmfd. This will make it less critical in adjustment, but we preferred to tolerate this in the original for the advantage of full coverage.

Regarding the winding and installation of the coils, one can only repeat the usual instructions. The data set out herewith were found suitable in our case and should be very close to the mark for most sets. Coils should be wound on good quality bakelised cardboard or low loss former. Don't take liberties with the data and don't think that an odd fraction of a turn does not matter. It most certainly does!

FINISHING THE COILS

Thread the ends of each winding in through the former and out again, leaving enough loose wire for connection to the switch or circuit points. Keep the turns taut and regular and space interwound turns centrally. To complete the coil, paint with trolitul varnish for preference and place the coil in a warm spot to dry.

PARTS LIST

1 Chassis 17" x 12" x 4".
1 Panel 18" x 10½".
1 Wave-change switch (see text).
1 Power transformer 100mA. 325v CT. 6.3v at 3A. 5v at 2A.
1 Filter choke 100mA.
1 3-gang condenser 250 mfds (bandset).
1 3-gang condenser 100mmfds (bandspread).
2 Vernier tuning dials (see text).
4 455 kc Iron-cored I.F. transformers.
1 B.F.O. coil 455 kc.
1 0-10 mA meter.
4 Valve shields.
1 25,000 ohm voltage divider.
1 1 meg. Potentiometer.
1 .5 meg. potentiometer.
1 .05 meg. potentiometer.
1 10,000 ohm potentiometer.
1 11 plate midget condenser (B.F.O. cond.).
1 S.P.S.T. toggle switch.
1 Phone jack.
9 Trimmers.

CONDENSERS

4 8 mfd. electrolytics, 1 .5 mfd. tub., 9 .1 mfd. tub., 2 .05 mfd. tub., 6 .01 mfd. mica, 1 .005 mfd. mica, 1 .001 mfd. mica, 1 .00025 mfd. mica, 3 .0001 mfd. mica, 1 .00005 mfd. mica, 1 10 mmfd. mica.

RESISTORS

1 10 meg., 1 2 meg., 8 1 meg., 1 .5 meg., 2 .25 meg., 1 .1 meg., 1 .07 meg., 3 .05 meg., 1 .02 meg., 2 2000 ohm, 1 1000 ohm, 3 300 ohm W.W., 1 250 W.W., 1 150 ohm W.W.

SOCKETS

8 octal, 1 4-pin, 1 acorn.

VALVES

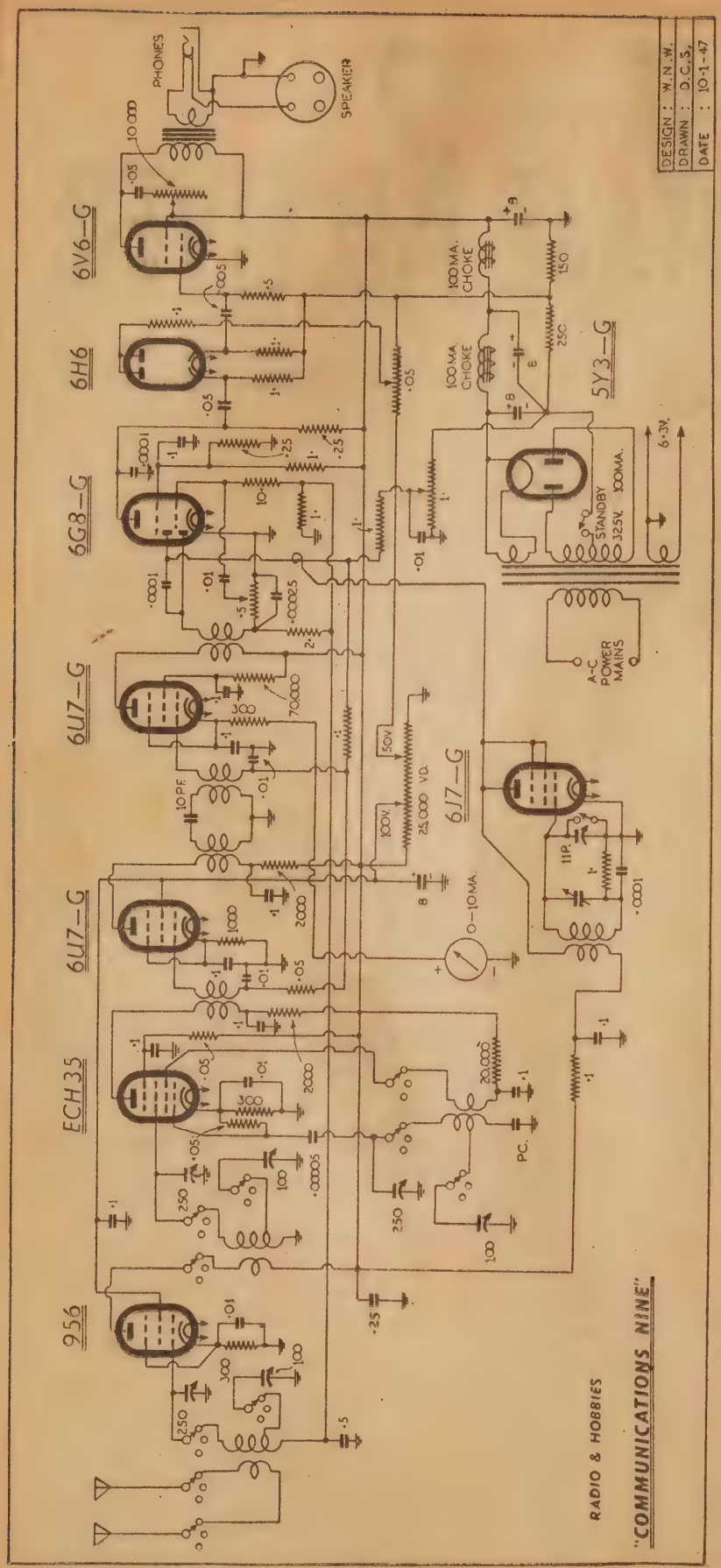
1 956, 1 ECH35, 2 6U7-G, 1 6G8-G 1 6H6, 1 6J7-G, 1 6V6-G, 1 5Y3-G.

SPEAKER

Permag. type matched to 6V6-G (5000 ohms).

SUNDRIES

8 knobs, 3 terminals, hook-up wire, shielded wire, nuts and bolts, solder lugs, 5 small grid clips, power flex, flexible coupling, resistor strips, spaghetti, scrap aluminium for brackets etc., ½" and ¾" coil former and winding wire.



Here is the complete schematic circuit of the receiver. For simplicity, only one set of coils has been drawn in, but coil data for all bands is given elsewhere in the article.

The switch used in our set is an unusual type, which has no special claims to preference except that it happened to be on hand. Whatever type you use, you will need three poles for the oscillator and R.F. circuits, and preferably four poles for the aerial circuit. At least four positions are required, unless you are prepared to sacrifice the bandspread on the 80 metre amateur band.

With 3x3 switch banks you could cover the 10, 20 and 40 metre bands with bandspread, tuning the 80 metre band principally with the bandset condenser. There is no strict need to switch both ends of the aerial coil primary, but, naturally, the more switch contacts and positions available, the more versatile the set can be.

When photographed, our receiver had only three sets of coils. These begin just on the high frequency side of the 10, 20 and 40 metre amateur bands. Tuning over the 80 metre band is accomplished in what might be described as a lazy man's way.

80-METRE BAND

The 40 metre coils tune over 80 metres quite easily, but the bandspread condenser is rather ineffective at 80 metres, with the bandset so far in mesh. To overcome this difficulty, the grid and plate lugs on the switch for position 4 are simply bridged across to those for position 3. The 40 metre coils thus remain in circuit, but the bandspread condenser is switched to the grid ends of the three coils instead of to the tappings. "Presto," you have normal bandspread on 80 metres!

There is actually room around the switch for another set of coils to tune from about 80 to 200 metres, but it is doubtful whether the time and trouble to wind and instal such coils would be warranted, since the set already covers to beyond 100 metres. Ultimately, we may instal a set of commercial broadcast coils (less cans) in the blank space. With the 250 and 100 mmfd. condensers in parallel no difficulty would be experienced in covering most of the broadcast band.

Some amateurs may sniff at the thought, but why not have broadcast programmes in the shack, if it only means the turn of a switch? But, please yourself. . . .

Mounted in the chassis, the switch must be rock steady. Plan your coil mounting arrangements ahead and make up the necessary brackets, mounting lugs, &c. The individual coils should be separated by more than the diameter of the former and so placed that the leads to the highest frequency coils are as short as possible. The aerial, R.F. and oscillator coils should be grouped separately to minimise intercoupling between stages.

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We mounted the aerial coils against the front of the chassis and handy to the appropriate switch banks. The R.F. coils were mounted on an aluminium bracket alongside the switch and partly straddling the converter socket. The oscillator coils are on a similar bracket immediately behind the switch. A "B-plus" lug was installed on each of the brackets to simplify the coil wiring, while the padder condensers are also on the oscillator bracket.

Trimmer condensers are necessary in parallel with each of the coils and we chose some imported concentric air-dielectric types. These are compact, stable, easy to adjust and have a capitance range of about 3-30 mmfd Locally made trimmers of rather similar pattern are available, but occupy more space. Avoid the use of dubious mica compression types, which have little to recommend them for this purpose other than their initial low cost. The trimmers are most important items.

THE CIRCUIT

It seems that a lot of space has been devoted to the coils and tuning system, but this is indeed the heart of the set.

Now for a review of the electrical circuit.

An R.F. stage is natural to a receiver of this type and we chose the 956 Acorn pentode for the position. The virtues of the acorn tubes above 30 megacycles are well known and quite a few of them appear to have reached the hands of amateurs since the end of the war.

Some readers may be keen to use one of the newer high slope pentodes in this position. However, don't be influenced purely by the high transconductance figures. These valves drastically load the input circuit and lose out badly as a result. Try connecting the grid to the tapping on the coil rather than direct to the grid end.

A small amount of AVC from the detector diode is applied to the R.F. stage. It is intended to serve no other function than to prevent the receiver blocking up when tuned to a strong nearby carrier This can occur when the R.F. and converter valves are operated permanently at maximum gain.

FREQUENCY CHANGER

The frequency changer is an ECH35 triode-heptode. The valve works very well, used in a perfectly conventional circuit arrangement As stated previously, there is no virtue in having a separate oscillator and mixer if the combination is merely equivalent to a single converter valve. We hope to experiment with converter stages at a later date, but, in the meantime, were not disposed to adopt any more complicated arrangement, simply because it may have looked more impressive.

It would be possible to use a 6J8-G converter with equivalent results, or a 6K8-G, with some small reduction in the number of oscillator feedback turns.

The choice of an intermediate frequency of 455 Kc. may come as a surprise to many, but it is quite deliberate. When we first built the receiver, it did include four 1600 K. transformers. At frequencies up to the 30 megacycle limit, the set was characterised by a unique freedom from second spot troubles or pulling effects in the converter.

Excellent, we thought, but the selectivity was another story, especially when tuning through the 20 metre amateur band at peak periods. Despite the use of four transformers, tuning on the bandspread dial gave the impression of completely inadequate selectivity.

So, with not a few misgivings, the higher frequency I.F. transformers were stripped out and replaced by four iron-cored 455 Kc. types—again from a disposals receiver. There is nothing unusual about these, but the selectivity showed a vast improvement. The change worsened considerably the image ratio and pulling effects above 15 odd megacycles, but we ranked this as the lesser of the evils. The whole story is a powerful argument in favor of double frequency conversion, but, in the meantime, we quite deliberately chose 455 Kc. (or thereabouts) as the intermediate frequency.

Two 6U7-G valves are used as I.F. amplifiers, coupled by a pair of transformers operating back-to-back. One does not need the full gain of both valves and the first is overbiased by the use of a 1000 ohm cathode resistor. The second valve has the normal 300 ohm cathode resistor, allowing the cathode current to vary downwards from a maximum of 10 milliamps, according to the negative grid bias. But more about the bias arrangements later.

A 0-10 milliamp meter is included in the cathode return of the second valve and serves as a signal strength meter. It measures the total cathode current of the valve and its deflection with full AVC applied to the valve gives a comparative idea of signal strength. A very weak signal will hardly operate the AVC, so that the meter reads nearly full scale. A signal of good strength will alternatively reduce the plate current to some very small figure. The meter face can be calibrated on this basis in terms of "R" points, but remember that an "R" meter should be treated as a purely comparative indicator and not as an absolute measurement.

It would have been possible to make the meter read forwards, but it is doubtful whether the complication of extra parts and an extra adjustment is warranted. The straightforward cathode current reading means just as much.

The screen feed arrangements and the decoupling provided around the first four valves minimises the chance of instability, although due care is necessary with the wiring and layout.

COIL DATA

10 METRE BAND (complete coverage 31-11.5 MC.)

Aerial coil: Secondary 8 turns, tapped at 2¾. Primary 2¾ turns interwound.
R.F. coil: Secondary 8 turns, tapped at 2¾. Primary 6 turns, 3 interwound and 3 below the secondary.
Oscillator coil: Secondary 7 turns, tapped at 2½. Primary 5 turns, 3 interwound and 2 below the secondary.
All three coils on ½ inch diameter former. Secondaries wound at 16 T.P.I. with 24 B&S enamel, primaries with 33 SWG DSC. Tappings and primaries located at cold end of the secondary, and wound as indicated. No oscillator padder is used on this band.

20 METRE BAND (complete coverage 17-6.5 MC.)

Aerial coil: Secondary 13½ turns, tapped at 3½. Primary 3 turns interwound.
R.F. coil: Secondary 13½ turns, tapped at 3½. Primary 8 turns, 5 interwound and 3 below the secondary.
Oscillator coil: 12½ turns, tapped at 3½. Primary 6 turns, 3 interwound and 3 below the secondary.
All three coils on ¾ inch diameter former. Secondaries wound with 18 B&S enamel and spaced over 1 inch. Primaries wound with 33 SWG DSC at cold end of the secondary. Tappings are also at the cold end. Oscillator padder .01 mfd. mica.

40 METRE BAND (complete coverage 7.6-2.8 MC.)

Aerial coil: Secondary 24 turns, tapped at 7. Primary 10 turns.
R.F. coil: Secondary 24 turns, tapped at 7. Primary 14 turns.
Oscillator coil: Secondary 22 turns, tapped at 6½. Primary 12 turns.
All three coils on ¾ inch diameter former. Secondaries close wound with 26 B&S enamel, primaries close wound with 33 SWG DSC and spaced 1/32 inch below the cold end of secondary. Tappings are also at the cold end. Oscillator padder condenser .001 mfd. mica.

80 METRE BAND

Switch contacts bridged to use the same coils as for 40 metre band. However the bandspread tuning condenser is switched from the tappings to the tops of the coils, being then directly in parallel with the band set condenser gang.

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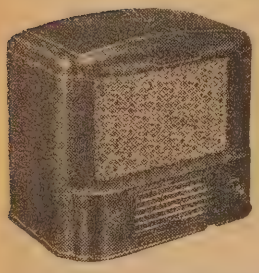

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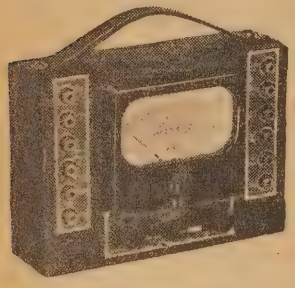

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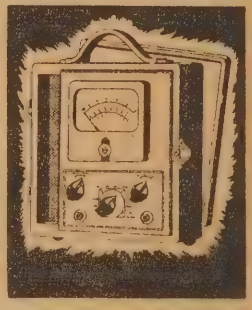

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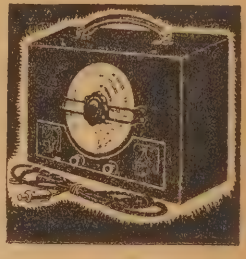

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The detector uses a conventional diode circuit and, considering the four 455kc. transformers, any loss due to its loading effect is offset by the convenience and simplicity of the circuit.

The AVC diode load returns to a potentiometer across the back bias system which allows anything from zero to minus 35 volts to be applied through the AVC network to the controlled grids.

With the initial bias set to zero volts, the AVC system operates in the normal way. However, as the potentiometer is rotated in the opposite direction, a progressively higher negative bias is applied to the AVC diode and AVC line. The gain of the controlled valves is reduced thereby and the AVC system rendered that much less effective.

When the control is turned to the full negative bias position, the AVC operates on only the very strongest signals and the control over gain is almost entirely manual. Thus the one potentiometer serves the dual purpose of AVC switch and manual gain control.

GRADUATED CONTROL

More important still, intermediate settings of the potentiometer give varying degrees of balance between the manual and automatic control. Thus the gain can be reduced sufficiently to receive morse signals cleanly, but the AVC will still smooth out strong signal peaks. Or the bands can be searched with medium I.F. gain, leaving the AVC to look after signals which would otherwise blast the loudspeaker.

Variation of the bias control potentiometer naturally affects the reading of the signal strength meter. But, even so, the deflection of the meter gives an idea of the sensitivity of the receiver when reading morse signals. For phone signals, the strength can be read off simply by advancing the bias control to full gain.

The pentode portion of the 6G8-G is used as an audio voltage amplifier, and the same small proportion of AVC voltage derived from the detector for the R.F. stage is applied to the grid of the 6G8-G as an audio AVC voltage. There is room for experiment in determining the optimum proportion of AVC applied in this way to the R.F. and audio stages, but its purpose is to help level out the audio signal voltage from carriers of different or varying strength.

There is good reason to seek a level audio signal, in that a special noise limiting stage is included in this set between the audio voltage amplifier and the output stage. In this position, the limiter operation is not directly dependent on, or affected by variations in signal strength. (The problems of manually operated and automatic noise limiters were discussed in an earlier article.)

Ideally, the control should allow the limiter to be closed down gradually to pass signals up to any desired amplitude, but clip sharply all peaks in excess of that amplitude.

The usual shunt type limiter looks delightfully simple until an attempt is made to make it continuously and symmetrically variable over an adequate signal amplitude range. One ends up with ganged potentiometers, balanced positive and negative bias sources and condensers in series with the shunt path. All these extra components tend to introduce time constant effects which allow the limiter to generate additional d-c voltages and to open up sufficiently to pass some of the very signal peaks which it is desired to suppress.

We ultimately adopted the alternative approach of putting the limiting diode in series with the signal circuit, so that it simply ceases to conduct on large signal peaks. A few minutes "nutting" with pencil and paper gave us a circuit which obviated the symmetry, time constant and impedance problems associated with the shunt type limiter. The final circuit is simplicity itself.

Assume that the noise limiter control is set to apply a positive voltage to the 6H6 diode plates. The cathodes are initially at the same negative bias as the grid of the output valve, so that both diode sections conduct at all times through the 1.0 megohm series resistors.

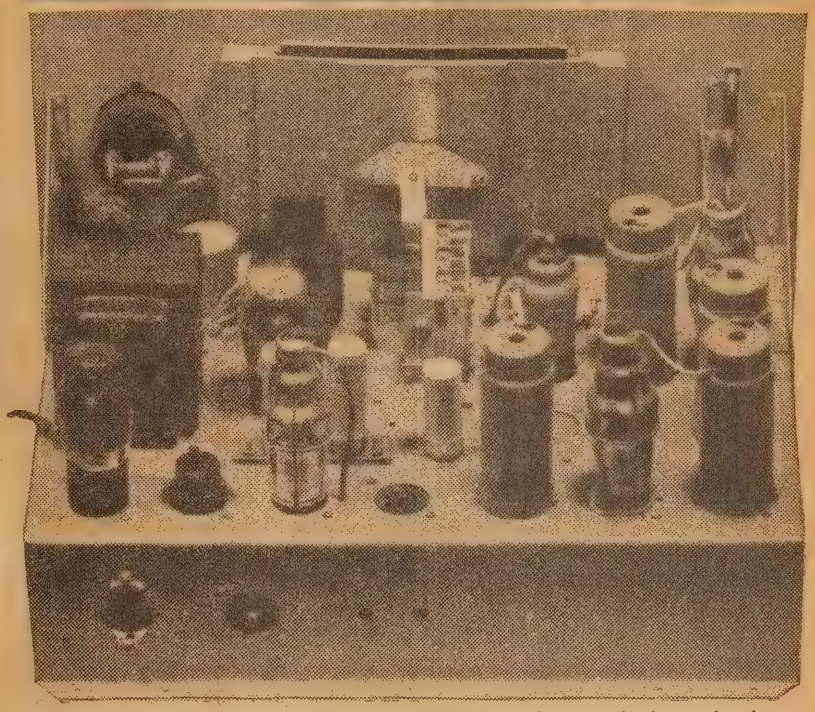
SIGNAL UNCHANGED

An impulse applied to the first cathode causes a corresponding impulse at the plate. This impulse, applied to the second plate, is transferred to the second cathode and thence to the output grid. Both diodes conduct during the whole time and no signal clipping results.

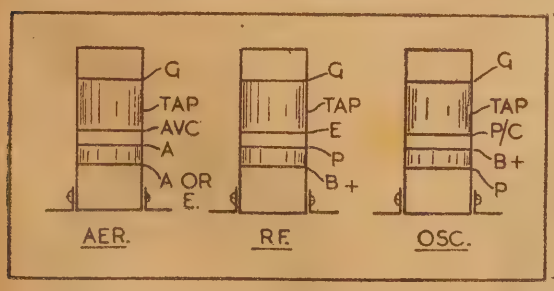
Now assume that the potentiometer is reset so that the diode plates are biased to say, minus 8 volts, as compared with minus 13 volts at the cathodes. A positive going signal impulse applied to the first cathode is transferred to the plate up to a peak amplitude of about 5 volts. If the amplitude exceeds 5 volts during part of the cycle, the cathode becomes positive with respect to plate, the diode ceases to conduct and the peak of the cycle is clipped.

A negative going pulse passes freely through the first diode, since it merely makes the cathode more negative still

A REAR VIEW OF THE SET



A view of the chassis from the rear. As explained in the text, the layout has been arranged to allow for possible future additions, or variations in design. Unused holes can be covered with disguise plates, enamelled grey.



This sketch shows the connections to the top and bottom of both windings. In some cases the primaries have to be completely or partly interwound.

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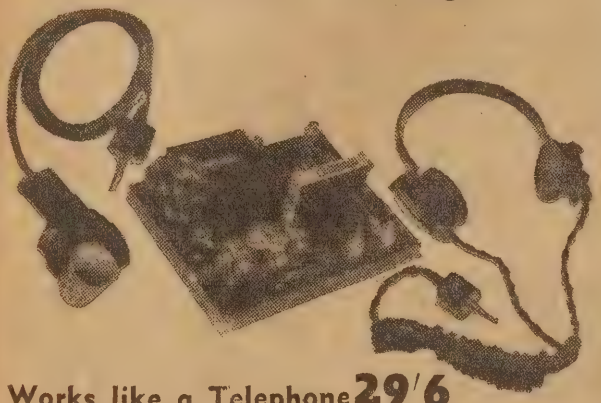

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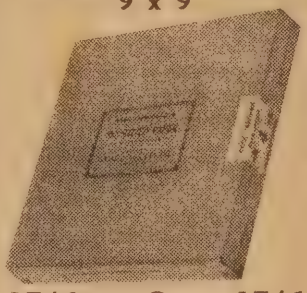

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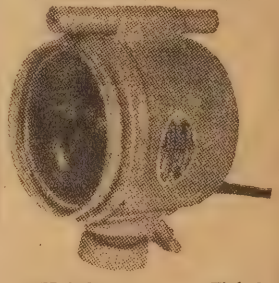

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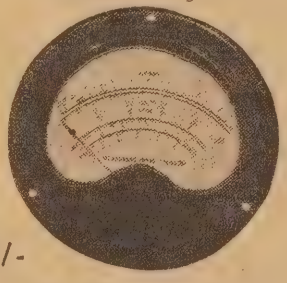

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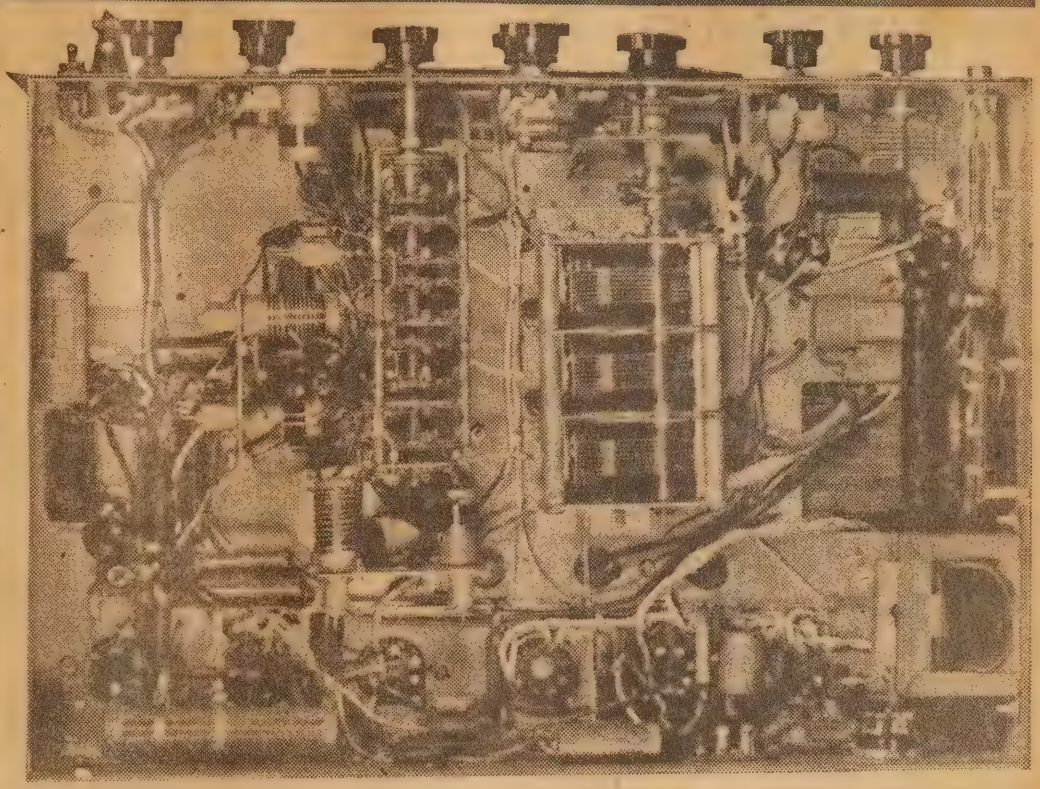

This photograph gives a fairly clear idea of the layout beneath the original chassis. Note the position of the band-set gang, wave-change switch and coils. The oscillator coils are on a bracket behind the switch, with the trimmers protruding rearwards. Most of the AVC and audio system wiring parts are on mounting panels along the rear edge of the chassis.

with respect to plate. But an impulse of more than five volts negative reaching the second diode plate makes that plate instantaneously negative with respect to its cathode. This time, the second diode ceases to conduct, and the negative impulse is clipped. By varying the setting of the potentiometer it is obviously possible to clip signals of any desired amplitude.

LIMITING ACTION

Normally the potentiometer is set so that the clipper is inoperative and the volume control adjusted to give the desired output from the loudspeaker. To bring the noise limiter into operation, the controlling potentiometer is gradually rotated until distortion of the signal just begins to be apparent. It can then be assumed that noise impulses of amplitude greater than the signal will be sharply clipped.

This noise limiter, in common with all others, is most effective against static crashes or automobile interference, where the noise voltages are normally of high amplitude, but short duration. In some cases the clipping action can be so effective that automobile interference can be rendered virtually inaudible. On the other hand, no noise limiter is of much use against interference which takes the form of a constant hum or buzz as a background to the signal. A noise limiter must therefore be regarded as a desirable auxiliary whose usefulness is dependent entirely on reception conditions.

The output stage is quite conventional and a series condenser with a 10,000 ohm potentiometer forms a simple treble limiting tone control. The low value of potentiometer serves to maintain a reasonable load on the output valve when the loudspeaker load is replaced by earphones.

The output transformer is installed underneath the chassis and the secondary winding connected to a phone jack on the front panel and a speaker plug on the rear of the chassis. The two are wired in such a way that insertion of the phone plug automatically cuts out the speaker. This is a very simple arrangement, but you will find that it works out quite satisfactorily with almost any loudspeaker or set of earphones.

FIDELITY QUESTION

The use of audio AVC, noise limiting and the simple earphone circuit signifies that we have paid more attention in the audio system to utility than to attaining extremely low distortion. This is quite in keeping with the purpose of the set, but, for all that, the reproduction on overseas broadcast stations sounds much the same as on any other ordinary set.

The power supply system is likewise quite conventional, providing 250-odd volts for the high tension supply and up to -35 volts back-bias. Assuming the use of a permagnetic loudspeaker, the power transformer should be rated at 325 volts 100mA, while the filter consists of two 100mA chokes and three 8mfd condensers. The use of a permagnetic loudspeaker is generally to be preferred, in that the receiver can be used for headphone reception without having always to worry about plugging in the loudspeaker field coil.

With a 385 volt power transformer, the second filter choke could be replaced with a 1000 ohm field coil or a 1000 ohm heavy duty resistor. This latter scheme was used in the original set.

The only other stage requiring comment is the beat frequency oscillator, which is triode connected for simplicity. We used the BFO coil from a No. 11 military transceiver, but a BFO coil can be made up quite easily from a discarded 465kc. transformer. For information on this matter we would refer you back to an article in the August 1946 issue, detailing the addition of a BFO stage to the "Amateur Junior" receiver.

In laying out the chassis for the receiver, we kept in mind the fact that it would probably have to accommodate parts other than those originally used and to be adaptable to possible variations from our original circuit.

EXTRA HOLES

There is a blank valve hole immediately behind the aerial terminals, and another one alongside the converter valve, which can obviously be used for a separate oscillator. Another blank socket is to be seen just ahead of the 6G8-G in case we decide at some future date to experiment with another type of detector. One plug at the rear of the chassis is for the speaker outlet, while the other carries filament and high tension wires for possible use with a UHF converter.

(Continued on Page 75)

Announcement

"Crown" D.C.2.A. Tuning Units for Broadcast and S/W. (13 to 42 metres) are now available to home constructors. This unit is designed to fit snugly into a chassis of 2¼in. depth. Each unit is set tested before leaving the factory. Retail price, 36/- . . . and of course the old "Crown" stand-bys are still available, B/C coils, S/W Coils, I/F Transformers, Tuning Dials, Padders, Trimmers, etc. Play safe and insist on "Crown" Parts.

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LAYING OUT YOUR CHASSIS

There comes a time when every enthusiast has occasion to build up a receiver or amplifier for a particular set of requirements and, as often as not, a special chassis has to be designed to accomodate it. This article gives a line-up on some of the points which have to be watched to ensure that the finished chassis is a success.

PERHAPS the simplest way to attack the job is to collect all the parts which will normally mount on top of the chassis and arrange them on a sheet of brown paper or blotting paper. By moving them around it is possible to arrive at approximate dimensions and at the same time obtain a very clear idea of just how efficiently or otherwise the wiring or small components will fit in.

In this preliminary planning, various factors should be allowed for. In most cases the spindle of the tuning condenser must lie along the centre line of the chassis, so that the tuning dial will occupy a central position. But, for mantel receivers, it may be necessary to mount the tuning gang towards one end of the chassis so that the dial face and loudspeaker grille will give some balance to the completed receiver.

TUNING DIALS

Most tuning dials will require a cut-out in the front edge of the chassis to allow for the drive mechanism and the flywheel, if any. It is therefore a good plan to decide beforehand on the type of dial to be used and note just how it must be mounted on the chassis. An appropriate cut-out could then be arranged, with the tuning gang pushed back far enough to allow its spindle to engage the chuck of the dial.

It is also necessary to consider how high the tuning dial must be mounted in relation to the chassis to give a balanced appearance to the completed receiver. With console cabinets, it is generally undesirable for the dial glass to be too low down in relation to the knobs, as it will not lie symmetrically in the front panel of the cabinet. In the case of a mantel receiver, both the height of the tuning dial and its lateral position on the chassis must have a definite relationship to the position of the loudspeaker.

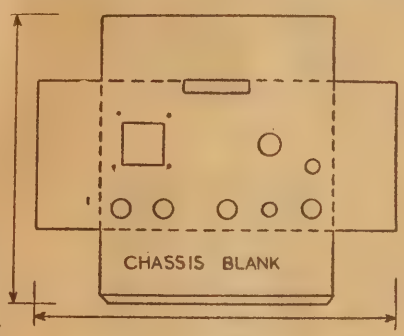
GANG HEIGHT

The height of the tuning gang above the chassis will influence which way up it should be mounted to ensure the shortest leads to the stators. For the same reason it may become desirable to arrange the sequence of the stages so that the converter valve and its associated components are either to the right or the left of the tuning gang, with the rest of the components following around the chassis in order.

The sequence of stages seldom presents any serious difficulty. The converter (and R.F.) valves normally mount alongside the tuning gang towards the front of the chassis. Thereafter comes the first I.F. transformer, I.F. amplifier, second I.F. transformer, detector and audio stages, according to the exact nature of the circuit. The power supply generally occupies the remaining space in front of the audio amplifier components.

In a small mantel type receiver it is often necessary to depart from an orderly sequence to conserve space, but every effort should nevertheless be made to avoid having the audio output leads and components doubling right back near the aerial input circuit. Another point is that heating effects can be minimised by keeping the rectifier and power valves to the rear of the chassis, where air can circulate freely around them.

Underneath the chassis the most important point to watch is the placement of any dual-wave bracket which may be employed. It must be located so that leads to the R.F. and converter valves are as planned by the manufacturer, yet the switch knob must balance other controls at the front of the chassis. A further point to note is that no part of the dual-wave bracket must be allowed to foul the tuning dial mechanism. Plenty of headaches can follow if the coil bracket and layout are not easily reconciled.



The chassis must be bent up from a flat sheet, the overall dimensions of which must allow for the sides of the chassis and any mounting flanges.

Having ultimately decided on the general layout the outlines of the various components can be sketched roughly, preparatory to transferring the design to an accurate drawing.

An accurate full-scale drawing of the chassis is essential before the metal can be punched. Popular imagination credits the chassis manufacturer with placing a piece of metal in some vague machine with the left hand and withdrawing a complete chassis with the right—a very happy circumstance if it could be true.

Actually, the first step is to cut a flat sheet of steel to the overall dimensions of the chassis, as it would be if it were flattened, top, sides, flanges &c. The rectangular sections corresponding to the corners are cut out, after which the chassis has to be punched.

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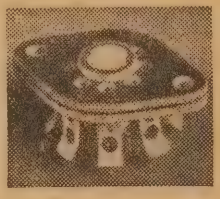

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From then on it may be handled up to 50 times as it passes around a series of presses punching holes of different sizes. In a "special" chassis, most holes have to be punched individually, and the tally of holes may easily reach 70. Bending, welding of the corners and spraying must follow before the chassis is complete.

The size of the chassis, as well as the complexity of the punching, determines its ultimate cost, so that there is some point in making the chassis only large enough for the job. The cost may also be influenced favorably if the dimensions are such that the chassis blank can be cut conveniently from a standard 6' x 3' sheet. This is especially true where more than one of the special chassis are required.

36" x 72"	24" x 18"
36" x 36"	24" x 15"
36" x 30"	24" x 12"
36" x 24"	24" x 10"
36" x 15"	18" x 18"
36" x 12"	18" x 15"
36" x 10"	18" x 12"
30" x 20"	18" x 10"
30" x 24"	15" x 12"
30" x 18"	12" x 12"
30" x 12"	12" x 10"

Table of the chassis blanks which can be cut from a standard 6" x 3" sheet without waste. You may save a few pence on each chassis by keeping it within these overall dimensions.

A chassis blank measuring say 18" x 15" could be cut very conveniently from a standard 6' x 3' sheet. This little waste. An extra half-inch each way would be a much less convenient size to cut and the possible extra wastage may add to the cost of the finished chassis.

The accompanying table, supplied to us by a chassis manufacturer, sets out a variety of chassis blank sizes which can most conveniently be cut from standard steel sheets. It is good practice to limit sizes so that the chassis can be cut and bent from panels corresponding with these dimensions or smaller.

Coming back to the tentative chassis layout, check the proposed dimensions and, allowing for sides and flanges, see whether the blank is a convenient cutting size. If not, a slight alteration may bring it into line.

The next job is to prepare an accurate full-scale drawing, showing the exact position of all holes, their dimensions and the positions of flanges, &c.

Use an accurate ruler and, by working on a drawing board or rectangular table, make sure that all corners are exactly square. Correct scaling and square corners are far more important than a "pretty" finish. Good drawings on white paper are helpful, but an accurate pencil drawing on clean brown paper is quite satisfactory.

For the sake of appearance, line up the centres of valves, coils and I.F. transformers which can be so lined up, making the distances easily measurable for simplicity. There is no point in making a dimension 1-15/16" if it can just as easily be 2".

For ordinary purposes the valve and other mounting holes can be drawn in to exact size with a compass, the small bolt holes being drawn to a diameter of $\frac{1}{8}$", or whatever other size is required. An experienced chassis manufacturer will know enough about normal practice to use standard hole punches for the various component mountings.

However, you may want to use a particular type of valve socket, for example, which requires a hole of fairly critical dimensions. Make sure that there can be no mistake by marking clearly the centre of the hole and showing the diameter. It is then not necessary to rely on the position and size of the pencil outline to convey the necessary information.

Remember to arrange the position of the sockets and coils to allow the shortest possible "hot" leads. In some cases, this will be governed by the position of the mounting studs with respect to the central hole. But, where this has not to be considered, have all the socket and coil mounting holes at

(Continued on Page 74)

THE STORY OF HENRY JONES
Young Henry was wiser than they thought. He was wise to his future and in his spare time became a
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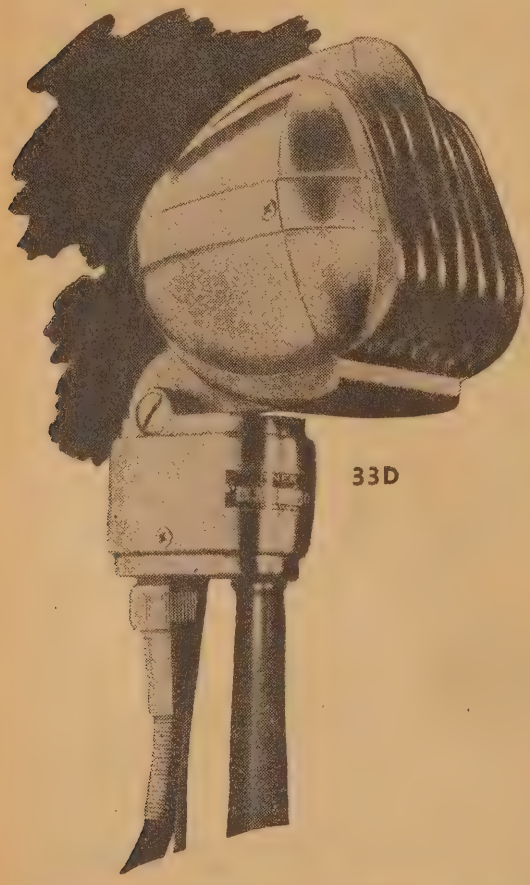

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A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

TWO VIBRATOR-TYPE POWER SUPPLIES

Here are a couple of circuits for simple vibrator power supplies sent in by readers. One provides alternative mains or battery operation for an amplifier, while the other is for use with small battery sets.

THE arrangement in figure 1 is along lines suggested by Mr. L. Turner. To make the power supply, he obtained an ordinary 385 volt power transformer and dismantled it, removing the laminations and the heater windings.

A new low tension winding for the vibrator circuit was wound on with 18-gauge enamel wire, being centre-tapped and having twice the number of turns as the original 6.3 volt heater winding. The 5.0 volt winding was then replaced, particular care being taken to see that the insulation was adequate.

The accompanying circuit shows how the complete power supply unit is wired. The changeover from mains to battery operation is effected by means of a 5 or 6 pole two-position switch.

With the switch in the position shown, the rectifier and high-tension

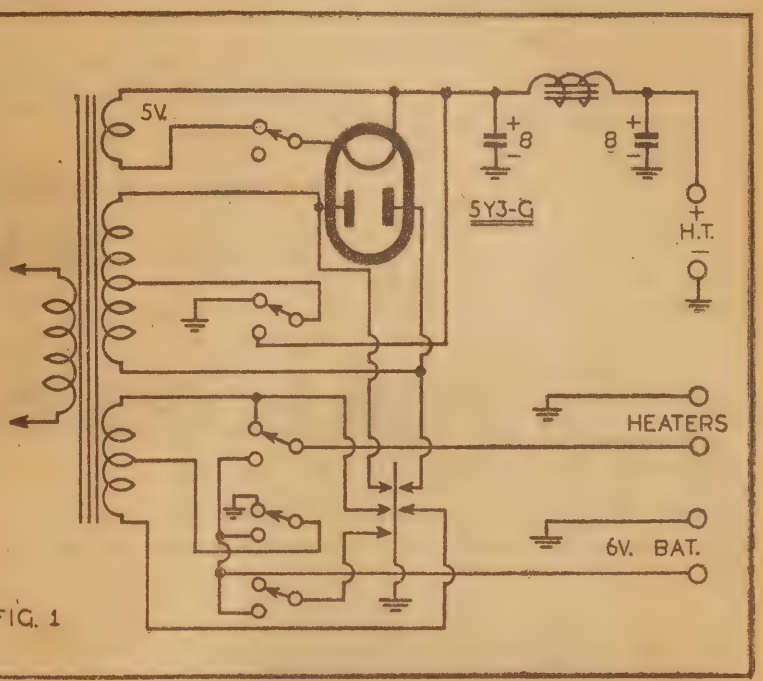

FIG. 1

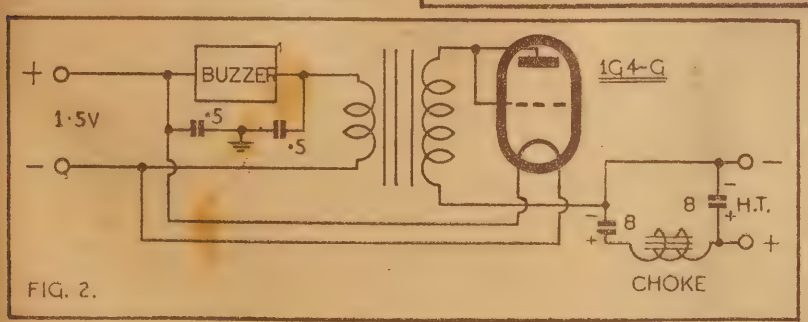

FIG. 2.

winding function in the normal way and deliver the d-c output from the rectifier filament to the filter circuit. The heaters operate from one half of the new 12 volt winding.

With the switch in the alternative position, the heater of the rectifier is switched off, so that it ceases to operate. The high tension centre tap is disconnected from earth and becomes the positive d-c output source. Simultaneously the heaters are switched across from the transformer winding to the battery terminals, while the 6 volts is applied to the winding centre-tap.

The remaining set of switch contacts brings the vibrator driving coil into circuit and allows the vibrator to operate. In vibrators which do not employ the separate driving contact, the switch could be arranged to break the connection between reed and earth, thus preventing a-c from affecting the cartridge with the switch in the mains position.

The original unit constructed by Mr. Turner operates an amplifier using a 6K7, 6C6 and 6N7, the latter operating in B-class.

Where the transformer already has two 6.3 volt heater windings, it may not be necessary to add a new winding for the vibrator. Try connecting the two 6.3 volt windings series-aiding to give a 12.6 volt output, with the junction of the two as the centre-tap.

SUPPLY FOR PORTABLES

Mr. A. Perrey, of Brisbane, has been experimenting with simple vibrator type power supplies for battery sets. Despite the elementary nature of the components, he claims excellent results. Perhaps other readers may care to experiment along the same lines.

The primary current to the transformer is interrupted by an ordinary buzzer, which can be rewound if necessary with heavier wire, so that it will operate reliably from the 1.5 volt source. The buzzer is connected in series with the primary or a transformer, which can be a filament or bell transformer. Rewind the primary, or use only portion of it, if it is tapped.

Output from the normal 240 volt winding is fed to the output load through a triode acting as a half-wave rectifier. Despite the apparently onerous conditions, the 1G4-G used has given good service, and other types, diode-connected, would probably be equally as effective.

No R.F. filtering is shown in the circuit, but an R.F. choke and paper condenser bypass in the high tension supply line could be tried if harsh troubles are encountered. The unit could also be constructed in a metal shield box.

Mr. Perrey reports that he has had no trouble with hash in the original unit, or in several others which he has built up.

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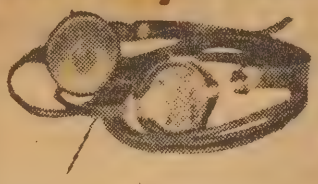

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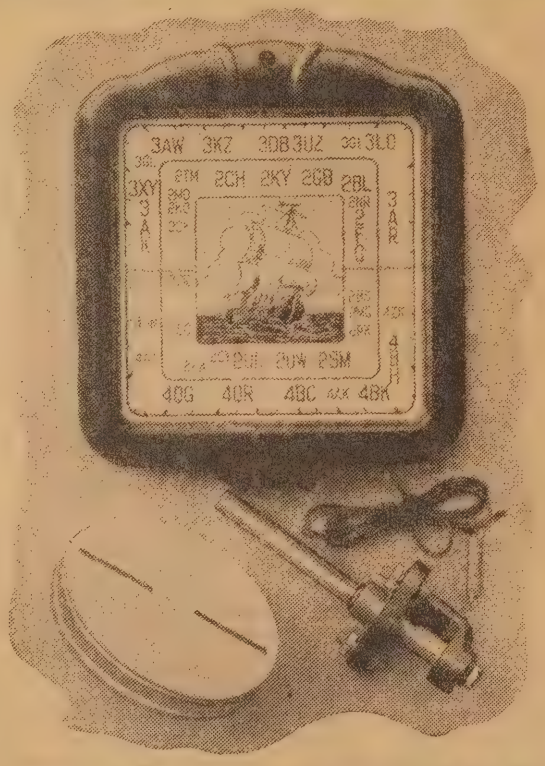

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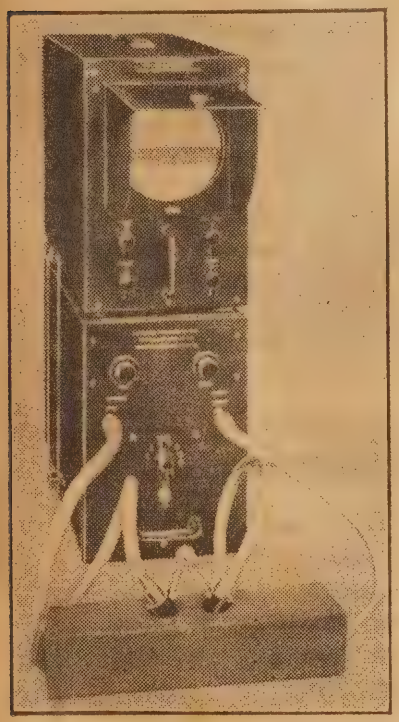
TRADE REVIEWS AND RELEASES

FLAW DETECTION IN METAL OBJECTS

Following an article in our November issue, Manufacturers Special Products Pty. Ltd. advise that the Hughes Supersonic Flaw Detector is available in this country for immediate delivery on indent. Of advanced design, the Hughes equipment is compact, readily portable and simple to operate.

THE principles of supersonic flaw detection were explained at some length in the November issue, but may be re-stated briefly. A special probe is applied to the surface of the material to be tested. The transmitter portion of the probe directs a narrow band of supersonic energy into the material and reflections occur from any discontinuity within the material and from its surfaces.



The reflections are picked up in the receiver portion of the search probe, amplified and displayed on the screen of a cathode-ray tube. The supersonic energy is pulsed and phased with the cathode-ray sweep, so that individual reflections appear as irregularities on a horizontal trace line.

Familiarity with the instrument allows the pattern to be interpreted with a high degree of accuracy, so that faults can be located and examined without in any way stressing or damaging the material under test.

The pattern allows the operator to gauge the position and the nature of the fault, its extensiveness and the depth in the material at which it occurs.

Extensive development has allowed a high degree of reliability and simplicity to be achieved in the equipment as designed by Henry Hughes and Son, of London. It is finding wide application in the detection of cracks and flaws in railway waggon axles and other equipment, many of the tests being possible without dismantling the machinery.

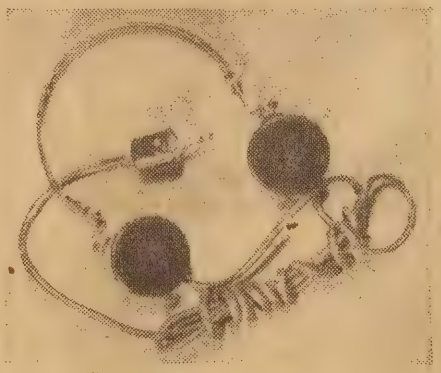
A selection of four operating frequencies is provided at the turn of a switch, while a fifth position excites the searching crystal with a general supersonic coverage. The test pattern is displayed on the screen of a five-inch cathode-ray tube.

With a search frequency of 2½ megacycles, the crystal in the probe operates at the natural mechanical resonance, giving high sensitivity. The condition is excellent for examination of smooth-surfaced materials, but sensitivity to porosity is too high for some purposes.

Progressively lower frequencies down to 0.6 odd megacycles give reduced sensitivity to porosity, less dependance on surface condition and therefore better results with cast materials. It is a matter of suiting the frequency to the particular type of test being conducted.

In the normal way, two sets of probing heads are provided with the instrument. One is essentially a pair of wedge-shaped probes for relatively

HEADPHONES



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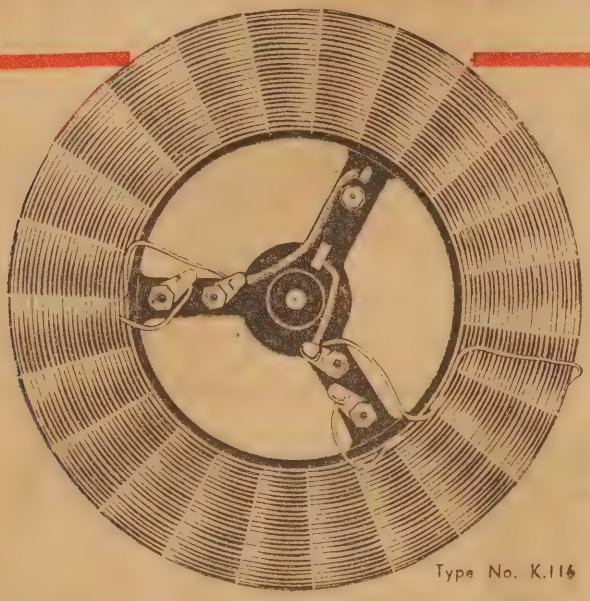

Type No. K.116

This special R.C.S. "LOOP AERIAL KIT" has been carefully engineered to give high performance with excellent stability, each component being designed to work efficiently in the complete kit, ensuring the elimination of alignment and tracking problems. This kit is prematched and tracked as a unit at the factory, on precision 'Q' meters.

KIT comprises—

1—loop aerial coil, 2—permatune intermediates, 1—oscillator coil, 1—padder and all are GUARANTEED ONLY IF USED AS RECOMMENDED IN THE COMPLETED KIT.

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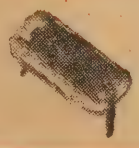

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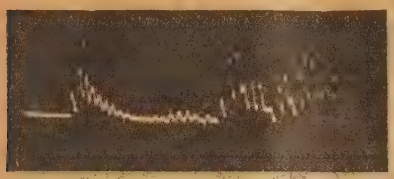
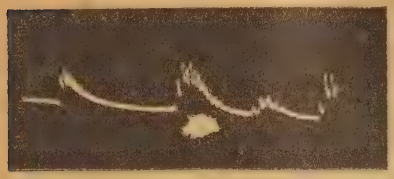
shallow work at between ½-inch and 6-inches from the surface. A second pair of parallel probe heads allow for test at depths in excess of six inches and up to a maximum of 12 feet. Non-



The pattern obtained from a circular with a serious longitudinal flaw around the central core. The peak to the left is the original pulse, while the scattered pattern to the right is reflection from the central fault.



The pattern from a square billet having a fine central crack. Note the initial pulse to the left, a large and a smaller reflection at the centre and the reflection at the right from the opposite surface of the billet.

standard types of search probe can be provided for special requirements.

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As chief medical consultant for the Army in the European Theatre, Dr. Pollack worked with concentration camp victims while the bullets were still whistling overhead.

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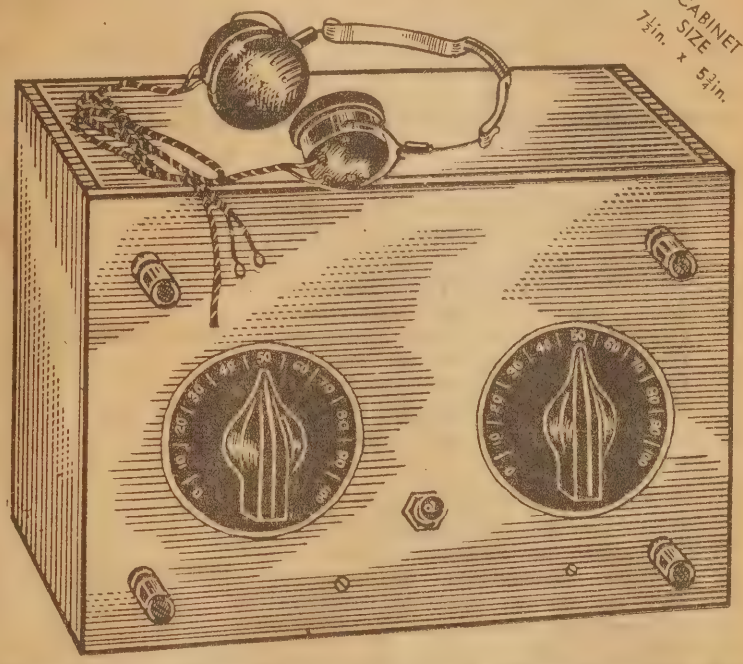

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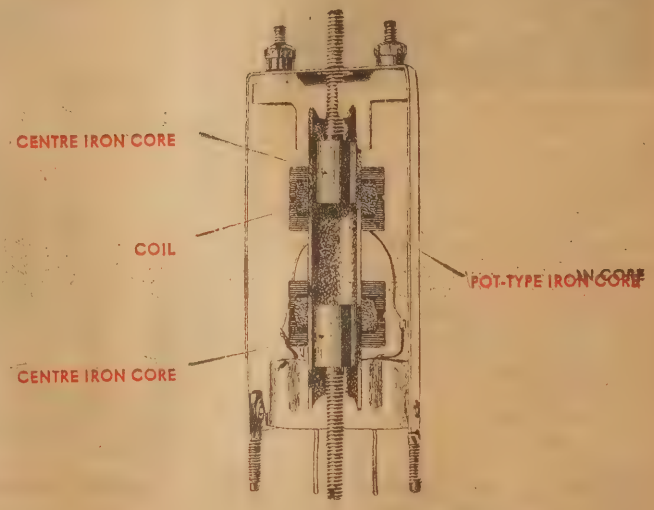
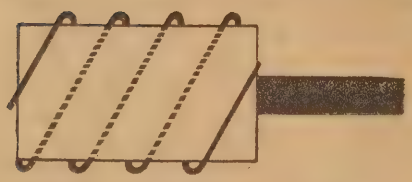


The above diagram is a cut away sketch of a PERMACLAD I.F. Tuning is done by the two centre iron-cores.



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MIGHTY FLYING WING A PIONEER?

Shown here is an artist's conception of the Northrop Flying Wing XB-35 bomber in flight over Los Angeles Top of the picture is south and directly under the Flying Wing is the famed Hollywood Park Race Track. Northrop Field, home of the Northrop Flying Wing XB-35, is approximately at the centre of the picture blocked out by the view of the bomber. Front view at upper left illustrates how little area the big ship presents to the air in flight.

A giant Flying Wing, with an overload gross weight of more than 104 tons, has been completed at Northrop Aircraft, Inc., in Hawthorne, California. It has been in construction since early 1943, and was originally designed as a bombardment-type aircraft of exceptionally long range and heavy load capacity.

HOWEVER, the design was such that it is now adapted as a cargo plane in the USAAF.

Known as the XB-35, the Northrop Flying Wing is 172 feet in span, with an area of 4000 square feet, and is capable of operating under overloading conditions at a gross weight of 209,000 pounds, more than 104 tons.

It is powered by four Pratt and Whitney Wasp Major engines.

Shaped like a giant boomerang the plane carries its crew of 15 in a pressurised nacelle, and its engines in submerged housing which do not protrude from the wing surface.

Northrop-designed "elevons" perform the functions of both elevators and ailerons, on trailing edges of the wing.

Span of each elevon is 34 feet six inches.

The trim flaps and rudder assembly are at the wing tips.

LANDING FLAPS

Landing flaps occupy the centre section of the span. Slots in wing tips aid in controlling the plane while flying at low speed.

Controls are actuated through full-boost hydraulic system to prevent excessive control pressures.

This is co-ordinated with special Northrop-designed pneumatic loading devices for the pilot's "feel."

With a flying range exceeding 10,000 miles, the XB-35 is capable of cruising at 345 miles per hour.

Designer and pioneer of the Flying Wing, Mr. John K. Northrop, for many years lived in "continual dread" of someone else developing another wing, because it seemed so logical and obvious that aircraft designers would proceed along such lines.

EARLY HISTORY

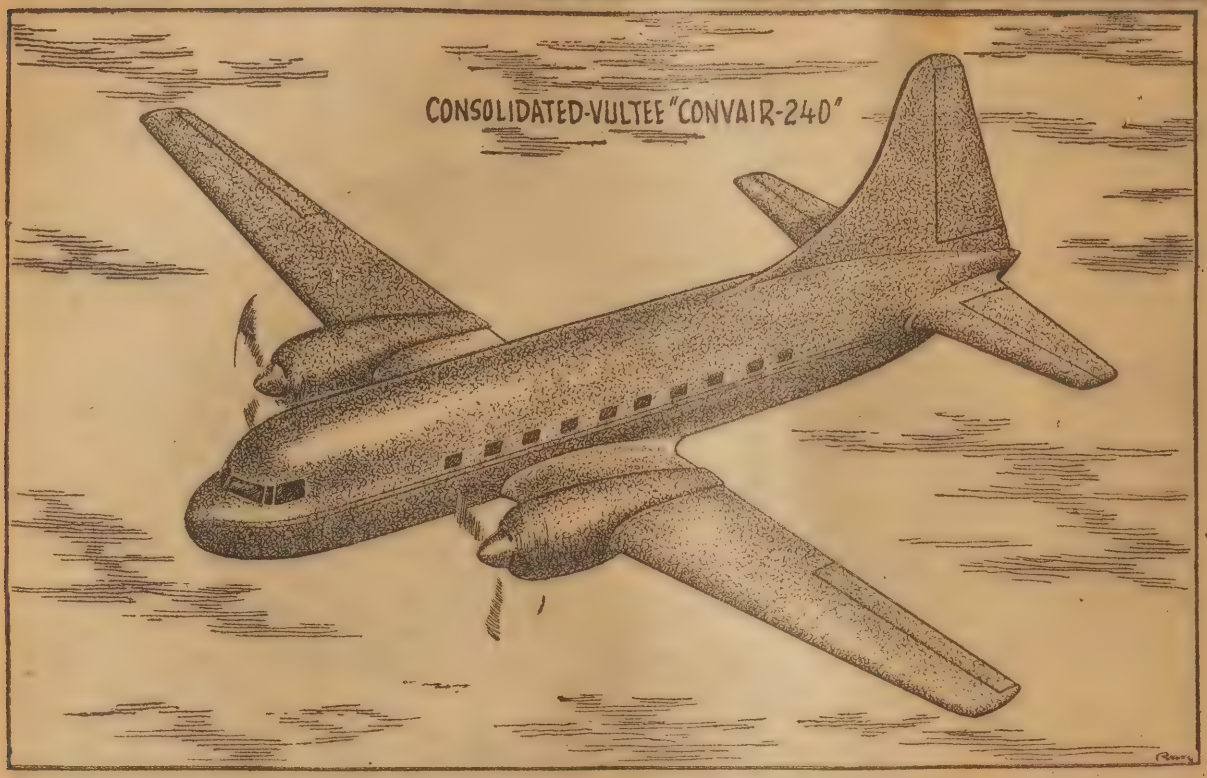
Burgess Dunn constructed a tailless biplane which flew in 1917. Lippisch in Germany and Hill in England, produced their own versions.

But all previous designers have used vertical tail surfaces or exposed engine nacelles or short fuselages or other drag producing elements.

Many flying-wing gliders designed by the Horten brothers made cross-country flights of more than 180 miles and made thermal climbs to more than 21,000 feet, circling through clouds and, in some instances, encountering icy conditions.

But, so far as is known, the Northrop design is the first which can be termed a true "Flying Wing," with control surfaces directly incorporated.

SOON TO BE SEEN IN AUSTRALIA



Offering greater speed and advanced comfort features, the new twin-engine Convair Model 240 airliner developed by the Consolidated Vultee Aircraft Corporation of San Diego (USA) incorporates all the latest technical developments which are sufficiently proven to be introduced on regular passenger services.

Large orders have been placed by leading domestic airlines in the United States for Convairs, and a recent announcement by the Australian Minister for Civil Aviation indicated that five of these aircraft are to be bought for Trans-Australia Airlines.

Providing a standard of air travel consistent with the progress in technical development which took place in aviation during the war years, the 40-seat Convair will bring to Australia internal air services comparable with the world's best.

PRESSURE CABINS

Pressurised cabins enable passengers to enjoy normal ground level air pressures, even when flying at 9000ft.

Designed to meet the requirements of high-density traffic on inter-city services, and to save time in taking on and putting down passengers, the Convair has built-in passenger embarking steps as part of the aircraft structure. These steps can be raised and lowered automatically by control from the pilot's cockpit.

The two Pratt and Whitney motors each develop 2400 horsepower. They enable the Convair to cruise at almost [illegible] miles an hour. The machine can climb on one engine at 144 feet per minute to 14,000 feet.

An interesting feature is the incorporation of auxiliary jet exhaust thrust for added speed. This is the first commercial transport plane to utilise the principle of auxiliary jet exhaust for extra power.

Reversible-pitch propellers are fitted and these, in addition to conventional wheel brakes and wing flaps, make it possible to pull the plane up with greatly reduced run after landing. Another factor is that reversible-pitch propellers enable the aircraft to back out from the loading position, resulting in a saving of valuable tarmac space.

A low-wing monoplane, the Convair design features the new high-efficiency wing. This is a very efficient high-speed aerofoil, while at the same time it includes characteristics which permit lower speeds for safe landings and take-offs.

SEATS 40 PEOPLE

The roomy cabin provides seating for 40 passengers. Amenities include an excellent buffet, vibration-damped seats and floor, sound-reduced cabin, radiant wall heating, and easy-chair comfort.

The anti-icing system uses heated air, which circulates along wing edges. The entire wing surface is warm, so that ice melts on contact.

Tricycle landing gear is fitted. The Convair thus lands level, and is still level when it comes to a stop.

The tail unit consists of a cantilever tailplane and single fin and rudder.

The new Convair-240 will be in service by the middle of the year. An official announcement has indicated that it is hoped that the five machines for the Australian Government-owned air service will be delivered in June, July, and August.

JET ENGINE FOR HELICOPTER

A SIMPLE pulsating-jet engine will furnish cheap auxiliary power to conventional aircraft, can be used at the tips of helicopter blades, power pilotless aircraft and assist glider take-off, has been mooted in USA. It is an engine of the type used in some of the Nazi bombs that fell upon London.

The engine as now developed is a simple power plant, requiring only air, liquid fuel, a shaped tube, some form of check valve, and a spark plug for starting. It can produce thrust of up to 900 pounds per square foot, with fuel consumption of only about one and one-half pounds an hour.

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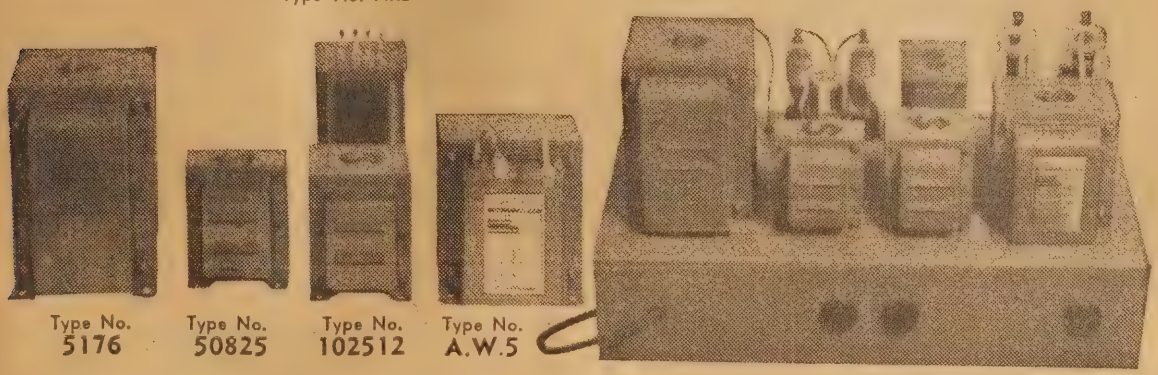

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A GUARANTEE OF DEPENDABILITY

A STURDY EASY-TO-MAKE CANOE

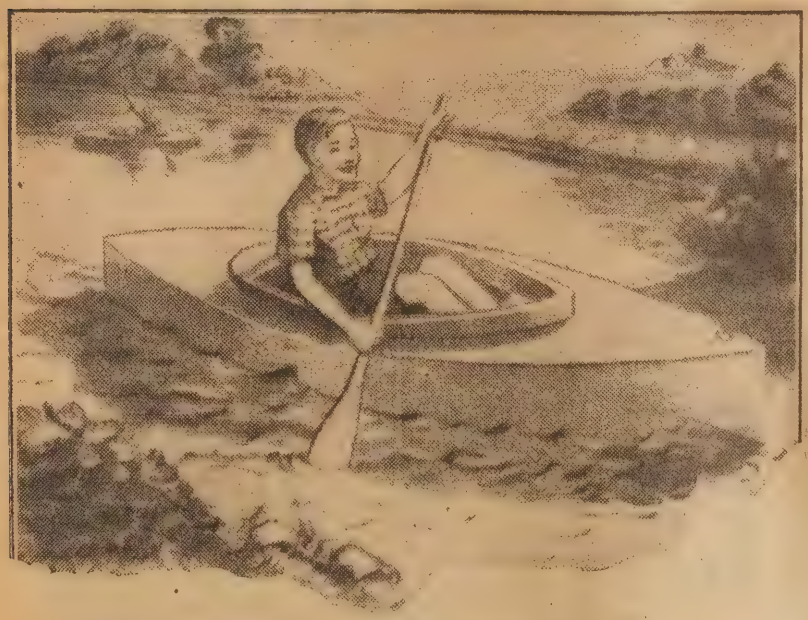


Fig. 1—A sketch of the finished canoe.

Simple, straight-forward construction is a feature of this canoe, which should be within the capacity of many readers whose hobby is home carpentry.

THE framework of a canvas canoe requires sound knowledge and wood-work experience to construct properly, then comes the difficulty of stretching the canvas over the frame in an expert manner, the cutting, tacking, stitching, waterproofing, &c. It is not everyone who feels like undertaking such a job, even though they have sufficient confidence in themselves. It is chiefly for this reason, therefore, that the light, all-wood canoe illustrated has been designed.

There is nothing elaborate about its construction. It is a simple, practical piece of work, and inexpensive, having a length of 8ft., with a beam of 22in. and a hull 11in. deep. The canoe is suitable for most boys aged from 12 to 14 years, and as it has watertight compartments fore and aft there is no likelihood of its sinking should it ever capsize in rough waters.

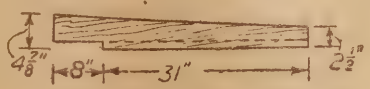


Fig 6—Coaming board.

The canoe is a flat-bottomed craft intended for shallow lakes, ponds and waterways. It is enamel-finished and makes a handsome little craft. Details of paddles are provided, and these—like the canoe itself—can be made cheaply from deal boards.

To make the bottom, two 10¾in. wide by 7-8in. thick prepared boards (shelving) are dowelled together. To make the joint waterproof, groove the edges (after setting out the position of the dowel holes and boring them with a 3-8in. bit) for a tongue of wood about 1in. wide by ¼in. thick. A plough-plane, fitted with a ¼in. wide cutter, is, of course, necessary here.

DECK TOP

The tongue-and-dowelled joint also applies to the deck (top) boards which, like the bottom boards, are 8ft. long. Having jointed the boards together, using waterproof glue or a thin oil paint as an adhesive, plane both sides with a smoothing plane. The outside shape, as shown at Fig. 2, is marked out, including the position of the two upright crosspieces forming the watertight compartments. Have the cockpit shape marked on the deck, but do not cut it out at the moment. The shaping, incidentally, is best done with a padsaw or keyhole saw.

Note that the stem and stern posts are recessed in the ends of the deck and bottom (see Fig. 9). The posts are best fitted when the crosspieces have been screwed to the bottom and braced, as shown at Figs. 4 and 5, following which the deck is attached, using paint and 2in. oval nails.

The inset at Fig. 9 shows an alternative post that may be used, which dispenses with capping pieces at the nose (bows). A suitable recess cut in the deck and bottom "locks" the posts not unlike a dovetail. You could at this point, line the inside of the work with slips of ¼in. square wood, keeping the slips flush with the shaped edges.

HULL, COAMING AND SEAT

To facilitate bending, the hull boards (sides) must be extremely thin. It is a good idea to purchase one unplaned

(Continued on Page 66)

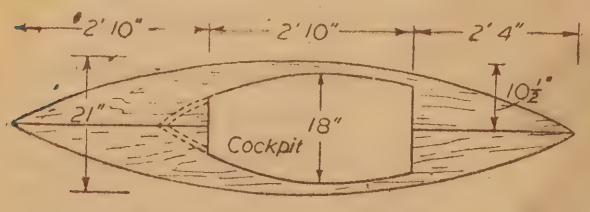


Fig. 2—Shape and dimensions of deck and bottom.

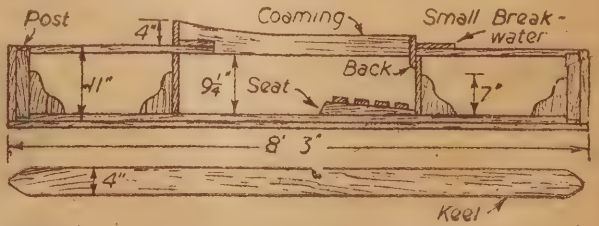


Fig. 4—A sectional view, with the full board removed, and details of the keel.

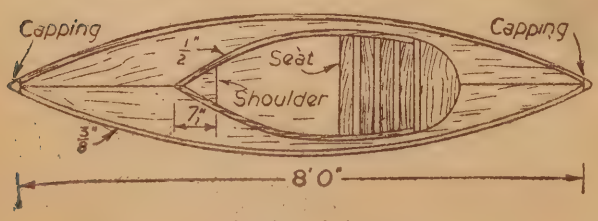


Fig. 3—Plan of the canoe.

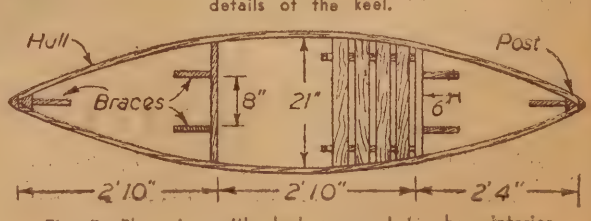


Fig. 5—Plan view with deck removed to show interior.

A FISHERMAN NOVELTY ASH TRAY

Here is the original model. The lighter parts are painted cream, the fish and jacket are fawn colored, and the hair and base are black. Brighter colors can of course be used, such as reds and blues.

The ashtray shown will appeal to the amateur sportsman who likes to have the incidental furnishings of his den in keeping with his hobby. Construction is not difficult, and if power tools are not readily available, alternative ways of making the parts will easily suggest themselves.

START by making the body of the man and also the fish. For this is required a piece of ¾" thick timber 5" x 3" for the body and 3" x 3" for the fish. Plane both faces of the wood smooth then mark out the shapes as shown in the illustration. They need not be exactly the same, but make sure that you get the general idea of movement so that when finished the fisherman looks as though he really is "in action."

Also be careful to see that the figures are marked out along the correct way of the grain. Saw the pieces to shape and clean up any rough edges.

THE BASE

The base is a circle of wood 3½" in diameter and ¾" thick, or alternatively a 4" square of the same thickness. A small chamfer can be taken off the top corner if so desired. A hole is drilled or chiselled in the centre of the base to take the dowel beneath the foot of the man.

To make the head as now described a lathe is a great help. Make a block by glueing several thicknesses of wood together, and of sufficiently large dimensions to provide a sphere of 3" diameter. No nails will be used in jointing these pieces of wood together so some care must be taken to get well made joints.

When the glue has set turn the head to shape. A hole is needed at the back of the head to provide a receptacle for the cigarette ash, so using a drill of about 1¼" make this hole.

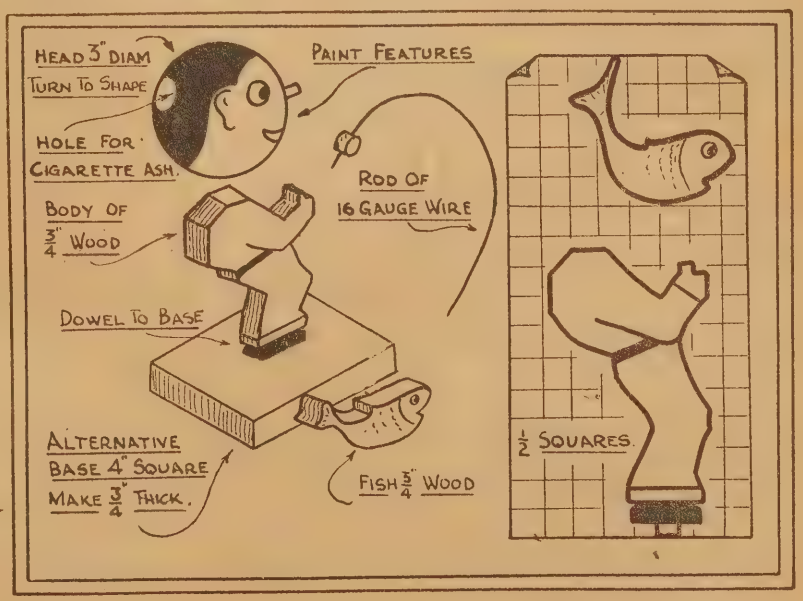
When the head is finished, the hole is disguised by the painted hair. Decide on the place for the snub nose. Make this from a small piece of ½" dowel, then drill a hole in the face and glue the nose in position. Further another small dowel must be glued into the base of the head and this will be used to join the head and body.

The ash hole must now be lined to prevent burning. Using scraps of tin plate, make a small cylindrical tin to fit inside the hole. Do not solder the joint until you have pushed it into the head and it will be found to fit much more tightly. Then cut a small disc for the bottom of the tin and after pushing it into place solder up all the joints.

SHAPING THE HEAD

If a lathe is not available, it is possible to shape up the head by hand. But better still, by making the proportions of the figure a little larger, it will be found that the spherical float from a cistern will prove just the thing. Carefully cut a hole in what will be the back of the head, and punch two small holes in the base of the neck to take two wood screws for fastening to the body. The nose will have to be built up and soldered on.

This part is made from a piece of soft wire which is bent to a suitable shape. A piece of wire about 12" long will be needed. The reel is a small piece of 3-8" round metal, say brass, about 3-8" long. Drill a 1-8" hole sideways through this and solder it in place on the rod.



All the dimensions etc. of the model are shown in this diagram. From them you can layout your own version.

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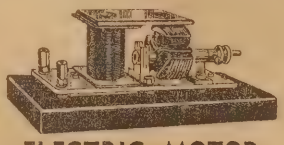

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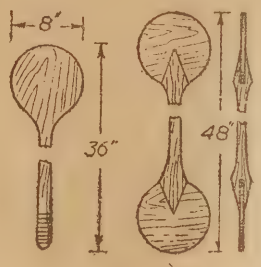
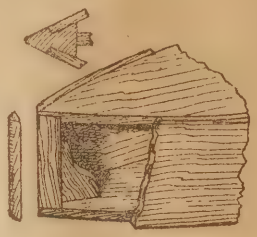
BUILDING A SIMPLE CANOE

(Continued from Page 64).

board 9ft. long by 11in. wide by 1in. thick and have it sawn in half, then planed to 3-8in. thick at a machine shop. The single board thus provides two thin hull boards 11in. wide. Pick a board free from knots (particularly "dead" knots) as much as possible.

Screw holes are bored and countersunk along the ends of the hull boards Prior to attaching the ends to the stem or stern posts, give the interior of the work a coat of creosote, including the hull, then coat all over again (at the joining edges) with thick oil paint or red lead paint.





Further details of paddles and the bow construction.

It is better to use paint than glue, especially ordinary hot Scotch glue, the latter hardening too quickly and being easily affected with dampness.

At the moment, bend and screw down the hull boards by gradual stages. It is best, by the way, to attach one hull completely before attending to the other hull board.

Having attached the hulls, remove the screws singly and plug the holes with putty, then carefully screw the screws home again. Brass screws and copper nails are preferred, as these are not liable to rust like iron screws or nails, if used.

THE COCKPIT

Cut out the cockpit (by boring a hole for the entry of the keyhole saw blade) and trim it neatly (with a spokeshave) to shape. A pointed shoulder piece is attached to the deck for the coaming pieces (see Figs. 2 and 3), these being cut to the shape shown at Fig. 6. Cut them from 3-8in. or ½in. wood and attach to the cockpit edges with screws, the points of the coaming pieces being mitred beforehand.

The back piece also serves as a seat back (see Fig. 4). A semi-circular piece of wood is attached to the deck against the seat back, this acting as a small breakwater; it is not an essential part of the canoe, but it adds to the appearance.

The seat is made from 2in. wide by ½in. or 5-8in. thick laths of wood, as shown at Fig. 7. A sloping seat is suggested in the side elevation at Fig. 4. Two supports are cut from 7-8in. stuff, with the laths nailed across. The seat should be fixed to the bottom of the canoe by screws, after which the keel of wood can be added to the underside, the length and width being shown at Fig. 4.

THE PADDLES

Some canoeists have a preference for a double-bladed paddle rather than a single-bladed one. Details are provided at Fig. 8 for both kinds, the single-bladed kind being cut to shape from a piece of 7-8in. wood 3ft. long by 8in. wide.

Note how the handle shaft tapers in the width. The blade itself should taper towards the end and also be spokeshaved away at the edges, thereby making it streamlined. The handle is either rounded or kept square in section, with the sharpness removed from the edges. The paddle should be made smooth in every way. Deal has been suggested, but the best kind of wood to use in making the paddle is birch, beech, oak or ash. In fact, any hard wood is preferred to soft woods.

If desired, saw kerfs could be cut in the handle at the top. The idea is to "line" the handle much in the same way as a wood chisel. The kerfs give the hand a better, non-slip grip.

The double-bladed paddle can be

A FISHERMAN ASH-TRAY

(Continued from page 65)

It is now time to assemble all the parts together. Sandpaper all the wooden pieces and smooth up any rough patches of solder. Put some glue on the dowel on the foot of the man and push it into place on the base making sure that it is a tight fit and also that the figure stands upright. If the base is circular flatten a small part of the edge with a file. It is here that the fish will be glued and nailed in place.

The position for this can best be judged by looking at the sketch. Attach the head to the body of the man by glueing the dowel. It is desirable to try and get the face to look downwards and towards the fish. Drill a 1-8" hole through the hand of the man, and also one through the mouth of the fish. When the rod is bent to shape the ends will fit into these holes. The ends of the wire should be burred up a little to make a tight fit and to prevent them pulling out.

made up like the one just described, using a piece of stuff 4ft. or 5ft. long by 8in. wide. You may prefer, however, to cut out circular blades from ¼in. birch plywood (if available) and fit them to a shaped handle, as shown. The grain of the plywood should run crosswise and not vertical.

A strong paddle can be made from 3-8in. plywood (for blades) and 1¼in. thick ash (for the handle). Several coats of thin enamel paint will help to preserve the wood and keep it damp-proof.

FINISH FOR THE CANOE

The finish of the canoe consists of a coat of creosote, followed with a coat of lead paint, then two coats of enamel paint of attractive color, such as bright green or else dark blue (royal blue), with the interior a brown color or bright red. The paddle is colored the same as the exterior of the canoe.

Naturally, the more coats of paint applied to the work, the more waterproof it becomes. Oil paint is excellent as a foundation paint and finishing paint.

The completed canoe will be found to be somewhat awkward to shift from place to place. A pair of large pram wheels, complete with axle, fitted in a temporary manner to the stem or stern of the canoe, will be found invaluable.

The wheels, if easily removed from the axle, can be stored in the canoe, together with the axle, for use whenever needed. Although constructed entirely from wood, the canoe will be found comparatively light and very buoyant, and being flat-bottomed, it will float in comparatively shallow waters.

CUTTING LIST

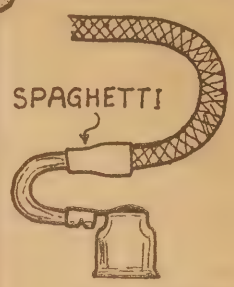
	Long.	Wide.	Thick.
4 deck and bottom boards . .	8ft.	10¾in.	7-8in.
1 hull board . .	9ft.	11in.	1in.
1 keel piece . .	8ft. 3in.	4in.	5-8in.
2 coaming pieces	3ft. 4in.	5in.	3-8in.
1 seat back . .	1ft. 6in.	4in.	3-8in.
2 cross pieces . .	1ft. 8in.	9¾in.	7-8in.
6 braces	7in.	6in.	7-8in.
2 nose posts . .	11in.	2in.	2in.
2 capping pieces	1ft.	1in.	7-8in.
4 seat laths . .	1ft. 9in.	2in.	5-8in.
2 seat supports	1ft. 1in.	2in.	7-8in.
1 paddle piece .	3ft.	8in.	7-8in.

Note.—Other small parts not mentioned above can be cut from waste wood. Sizes stated are not net.

Some Workshop Hints

AERIAL SPREADER

If you are keen to erect a two-wire aerial beneath a tiled or slate roof, a sturdy coat hanger will serve as an excellent spreader for the wires.

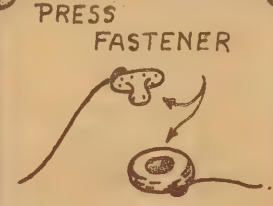


FINISH TO BRAIDING

A half-inch length of spaghetti tubing of suitable size will add a neat finish to the braiding on a shielded wire. Enlarge one end with the point of a screwdriver.

INSULATOR HINT

A handy insulator can be made from the handle of a worn-out toothbrush. Cut it off as shown, round the end and drill an extra hole to correspond to the existing one.



SIMPLE CONTACT

An ordinary shiny press fastener, used by dressmakers, can be adapted to make and break contact between two wires. Several fasteners allow circuits to be interchanged.

2,000,000 VOLTS X-RAY MACHINE

Installation of a large X-ray machine—2,000,000 volts—for the purpose of examining welds in pressure vessels, will bring to 12 the number of X-ray machines used for this purpose by the Babcock and Wilcox Company, manufacturers of steam generating equipment.

A special building will house the new machine and it will be erected adjacent to the location of the present 1,000,000-volt X-ray unit. The building has been designed to protect personnel from radiation and to make possible examination of the largest size drums made by the company.

Although the apparatus is capable of operating at any voltage from 1,000,000 to 2,000,000, it will be used principally at the higher voltages, to take pictures of heavy welds, four inches thick and over. As compared to the 1,000,000volt X-ray, the new unit will produce much clearer pictures in that thickness, and will reduce by half the average time required to take radiographs.

It can be used successfully on steel walls 10 inches thick. The specially designed building will be 35 feet wide, 31 feet high, and 81 feet in length. Double walls consisting of 42 inches of sand solidly packed between quarter-inch steel plates will prevent radiation from the unit. The building is planned to provide all possible safeguards to protect not only technicians within the building, but anyone in the immediate area.

An overhead, floor-operated crane will support the X-ray unit and move it arond within the building. The X-Ray machine is 5 feet in diameter, 12½ feet in length, and weighs 6000 pounds.

THE HAM BANDS WITH BILL MOORE

RULES FOR THE B.E.R.U. CONTEST

Now that amateur radio is settling down to a pre-war basis, we may expect a renewal among other things, of contest activity.

THE RSGB has announced the 1947 rules for their very popular BERU contest.

This contest, so well supported by Empire amateurs in prewar years, should again be very successful. Rules are very similar to previous years—Egypt and Iraq are no longer parts of the Empire, being one change.

Entrants must be members of the RSGB or of one of the British Empire societies. Membership of the WIA covering Australia and NZART, New Zealand.

A resume of the rules is as follows:—

There will be three sections. Senior or high power, junior or lower power and reception section.

Only one person will be permitted to operate one station.

Trophies and certificates will be awarded to winning competitors, but one station can't win both the senior and junior trophies.

All entry forms and logs must reach the RSGB HQ, New Ruskin House, Little Russell-street, London WC1, not later than June 2, 1947.

The senior high power test extends from 0001 GMT, Saturday, April 12, to 2400 GMT, Tuesday, April 15. A maximum of 30 hours operation may be selected from the 96 total hours available. Only stations contacted during the 30-hour period will count as points.

15 points will be scored for the first contact in any prefix zone, 14 for the second, 13 for the third, and so on.

Only one contact is permissible with any one station on each band.

Power limit, 150 watts.

A serial number, including RST report, must be exchanged.

JUNIOR LOWER POWER CONTEST

Rules are the same as those in the high power section, with the following additions:

The input to the final valve must not exceed 25 watts.

Duration of the junior test will be from 0001 GMT, Thursday, April 17, until 2400 GMT, Sunday, April 20.

The serial number of six figures includes RST for the first three and 001 for the first contact and 002 for the second, &c.

Prefix zones are divided up as follows:—E1, G, GC, G1, GM and GW—ST and VQ6—VE1—VE2—VE3 and VE4—VE5 and VE6—VE7 and VE8—VK2, VK3, and VK7—VK5, VK6, VK8, ZC2 and ZC3—VK4 and VK9—VO1 to VO6 inclusive—VP1, VP5, VP7 and VP9—VP2, VP3, VP4 and VP6—VP8—VQ2 and ZE1—VQ1, VQ3, VQ4 and VQ5—VQ8 and VQ9—VR1 to VR6 inclusive, ZK and ZM—VS1 to VS5 inclusive—VS6, VS7, VS8 (VU7) and and VS9— VU2 and XZ2—ZB1 and ZB2—ZC4 and ZC6. ZD1, ZD2, ZD3, ZD4, ZD8 and ZD9—ZL1 to ZL4 inclusive—ZS1, ZS2 and ZS3—ZS4, ZS5 and ZS6. It's a nice list of DX, a lot of the prefixes used only to appear in the BERU tests, so give it a try.

HIGH-POWER COMPONENTS

THE vexed question of high power components is well answered by the WIA'S Federal President, Vaughan Marshall, VK3UK, in an editorial in "Amateur Radio." To quote: "You can, and always have been able to, use individual components including tubes, condensers and transformers, with ratings in excess of your licenced power, providing your transmitter is not deliberately designed to operate in excess of that power. For example, if you have obtained an 813 through disposals, there is no reason why that tube cannot be used with a "B" class licence, provided the transmitter is not built to operate the tube at its full rating. Nor do you need special permission to use it. That has been the position for 20 years and it does not differ one iota today."

6MX BAND STILL OPEN

ON many occasions during the past month, the 6MX opened for interstate contacts. Communication was achieved between NSW and SA and VK2AHF and VK5QR made the first contact. 5QR was contacted by other Sydney stations on the same evening. NSW stations have now been in communication two-way with three States, some encouragement surely for UHF experimenters. VK4PG in Bundaberg has been heard in Sydney by 2NO and others at various times during the day. Don 2NO was heard in Hobart by Crosby Walsh, VK7CW, who unfortunately had no transmitter operating at the time—this has now been rectified.

2TC has been QSO with 3YS, one of the first country stations to meet with success.

2LY in Katoomba, with 15 watts to an 807, has been making plenty of interstate contacts. The VK4's have broken through to VK5, only VK6 has to be contacted to complete the round.

In a letter to VK2NO, WIDHK, of QST, stated that his signals were being received in England by G5BY. Australian UHF experimenters hope that it will not be long before they bridge the Tasman on 6MX.

2LZ in Wentworth Falls is having quite a successful time, in between power leaks.

BRITISH NATIONAL SOCIETY

WHILE the postwar growth of the WIA has been extremely satisfactory, the growth of the RSGB during the war years was extraordinary. Prewar membership has grown from 3000 to 12,000, and 181,000 copies of their handbook were sold, mainly to Service personnel.

The rapid growth has consolidated the society's financial position and has allowed the council to call for applications for a technical manager and an assistant to the general secretary.

Greatest problem is to get sufficient paper to increase the size of the official organ, the "RSGB Bulletin." Paper is received on a prewar circulation basis, but with a fourfold increase in the membership, the size of the "Bulletin" suffers.

In place of the handbook for the present it is intended to publish eight booklets, covering separate sections of amateur radio activity—micro-wave technique and aerials being two headings. Each booklet will be written by two well-known British amateurs. The publishing of these booklets will be watched with interest.

DX AND PERSONAL NOTES

LAST month we mentioned 2AHM's QRP WAC on four watts but didn't say it was on telephony—so there shouldn't be any claimants. Thirty-five countries on his QRP phone postwar is the tally. The WAC was on 10 MX by the way.

OX3GE, Greenland, a nice country, with ZD4AB, Gold Coast, were workable at 0300 hours on a couple of mornings.

2EO, no beam DX-er de-luxe, to keep in form, was WAC before 1700 hours on New Year's Day.

The EP's from Iran are very consistent, but hard to raise. We only hear stuff from the back of their beams apparently.

VO6F was QSO-ed at 1200 hours on 20 mx.

VK2VN is heard doing the rounds of the W6 shacks; will be making for the East coast shortly.

2QL's DX is limited these days with a rather heavy power leak in evidence. He is quite worried about the stuff that calls him and can't be heard.

20 MX conditions over the Christmas holidays were very poor, two short peaks about sunset and sunrise were the only times with much DX present.

The Europeans on 40 mx in the late early hours are at excellent strength ;the band only wants a little more populating to be very useful. Short-wave telephony stations cause some interference, but there are still clear spaces.

VK4CU operated portable over the holidays, call sign 4DQ-2OF Orange with 2½ watts to a 6P6 suppressor modulated pretty portable also.

Old-timer VK2OR,, still in England with the RAAF, should be back in March, looks for VK's on 14,128kc's, his call sign G2YP. Says the American stations rub out most VK signals.

2ACX received cards from Eritrea, British Somaliland and the Sudan within a few days, and some people wait for a plain ZS card for years.

7 & 14 MC BANDS

RELEASE of additional frequencies in the 7 and 14 MC's caused some confusion overseas, from stories now filtering through.

American target date for release was December 1st, and British date November 1st. The November date was suggested as a more suitable one to the American authorities, but was not accepted. However, on November 1st, American hams received notice to proceed leaving the G's well up in the air and it was not until November 6th that British PMG gave the final OK to operate; Australian stations finally received permission on November 15th. A little confusion does not really matter, providing we finally get on with all prewar allocations.

COALFIELDS' NEWS

A BRASS-POUNDER at heart, 2KZ is heard on telephony—3DG with a zepp works the elusive DX—2TY just back from a VK4 holiday—2PZ and 2XT were in Sydney for the WIA meeting—2ADT, leading DX man, has 67 countries up postwar WAC in a few hours—2YL and 2ADT visited 2FP to view the 50-foot tower and rotary and were very impressed.

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SHORT WAVE NOTES BY RAY SIMPSON

SEASONAL FREQUENCY CHANGES
MANY INTERESTING VERIFICATIONS

As our more experienced listeners are well aware, the various seasons of the year necessitate a change of frequency in order that a station will put in a good signal in the areas to which it is beamed.

AS an example of this we have the United States stations KNBA and KNBI which have now moved back into the 49 metre band at night and operate on 6060kc., where they put a very nice signal into this country. Before very long we can expect to find KRHQ back on their old frequency of 6120kc at night instead of 9650kc.

READER'S VERIFICATIONS

One of the chief benefits of the improved mail service between Australia and overseas has been the large number of verifications which have recently been received by our readers. In some cases they were for reception reports sent before the war and which had evidently been held in abeyance until hostilities were over. One of our own in that regard was KIEK which took over 5 years to arrive

Mails between here and the USA are still rather erratic however, and sometimes quite a few weeks elapse before anything comes in and then there is usually another mail just a few days later.

Cards and letters are now arriving from what used to be enemy countries such as Italy, Siam, &c., and quite likely before very long the German stations will be operating under their own control, and once again begin to acknowledge listeners reports

We have had rather a good month ourselves, as regards verifications, our total being 27, which included two more first reports from Australia. Rex Gillett also had a very good first report in KOFA, besides receiving quite a number of other very interesting cards.

Some listeners do not bother with sending reports to stations, but in our opinion this is one of the most interesting phases of our hobby, and we still get a kick when we receive a new card.

B.B.C. STATION LIST

In answer to our query of a few months ago, as to whether readers wanted the B.B.C. stations to be listed individually in the station list, as we have always done or whether they would prefer a programme schedule from time to time as given in the January issue, the latter seems to be the choice of the majority who have replied. So until further notice we will adopt this method of covering these stations

In next month's issue however, we will give a complete list of all B.B.C stations by call letter, frequency, and wavelength which will serve as a reference when used in conjunction with their programme schedule

U.N.O. STATIONS
HEARD ON 19m. BAND

For a few weeks now we have been hearing a station on the 19 metre band operating on 15190kc. which identifies itself simply as "This is the United Nations Station" and then goes on to tell of talks to be given by people in different languages.

IT seems to be on the air every night around midnight and quite often plays symphony numbers without announcements for 15 minutes or more. On the hour, chimes are used something like the familiar NBC and then announcement is given first in English and then in other languages.

For some reason we suspect this to be actually a Russian station as there is nothing to identify it more closely and it somehow sounds like a Russian, though we have never heard Moscow mentioned at any time.

Perhaps some other listeners have heard this one and possibly have more information on it than we have just now. We have not included it among this month's new stations, because of the doubt as to who it really is. It would not be surprising if The United Nations did establish their own station in the USA, but somehow we do not think the one we are hearing is the official station, but possibly a session which comes on the air at the particular time we have been listening.

READERS' REPORTS

OUR thanks are due to the following readers who have sent us reports giving details of their loggings during the past month. Mr. G. Hart, Mackay, Qld.; Mr. M. B. Pullman, Myilly Point, Darwin, N.T.; Mr. H. Cox, Cobden, N.Z.; Mr. Art. Cushen, Invercargill, N.Z.; Sgt. K. Moorehead, BCOF, Japan; Mr. N. Armstrong, Burwood, NSW; Mr. R. F. Boyle, Rockhampton, Qld.; Mr. A. W. Kew, Bankstown, NSW; LAC R. Vincent, Northbridge, NSW; Miss D. Sanderson, Malvern, Vic.; Mr. R. Gillett, Prospect SA; Mr A Lee Merewether NSW

SHORT WAVE D.X. COMPETITION

As the majority of our readers are now out of the forces and settled down to their old hobby again, we think the time is ripe to conduct another DX competition along the lines of the one we had a few years ago which proved very popular.

THE exact nature of the competition has not yet been decided and before any decision is made we would like to have the views of as many listeners as possible so that the competition will prove interesting to the majority of those who read our pages.

The writer will present a trophy to the winner and it is hoped that we may be able to interest some of our advertisers in donating additional prizes.

It may be advisable to run two sections, one for the more experienced DX listener and the other to cater for those who have only recently taken up the hobby and who would otherwise feel at a disadvantage in competing against some of the old-timers.

Some suggestions we offer are: (1) The most verifications over a period. (2) Highest number of verifications from each continent. (3) Greatest aggregate mileage for a given number of verifications. (4) Highest number of verifications for reception from 17 m.c. upwards. (5) Highest number of First report from Australian verifications.

Think it over during the next month and in your next letter let us know what your views are, giving any suggestions you have to offer and how you think the competition should be arranged and we will then be able to draw up the necessary details and have them published in an early issue.

We would like this proposed contest to be really worthwhile, as it would stimulate interest among all short-wave listeners both in this country and overseas as it would, of course be open to New Zealand and, if possible, other countries as well.

Let us make 1947 a real DX year and see who will be Australian champion so far as DX listening is concerned.

FLASHES FROM EVERYWHERE

CHINA. We are indebted to the "Universalite" for a list of the new stations to be operated by the Central Broadcasting Administration in Nanking which is as follows:—

XGSA 6040kc., XGSB 6080kc XGSC 6095ks. XGSD 6105kc., XGSE 7200kc., XGSF 7257kc., XGSG 9535kc., XGSH 9560kc., XGSI 9655kc., XGSJ 9675kc., XGSK 11,725kc., XGSL 11,735kc., VGSM 11,800kc. XGSN 11,880kc., XGSO 15 105kc., XGSP 15,135kc., XGSQ 15,255kc., XGSR 15,235kc., XGSS 17,755kc., XGST 17,785kc., XGSU 17,835kc. XGSV 17,845kc., XGSM 11,800kc., XGSN 11,880kc., XGSO 21,550kc. XGSZ 21,620kc. Quite likely before these lines are in print, some of these stations will be on the air

CENTRAL AMERICA. It is only a few months since the new Panama station HOXA opened and now we have another new one, but this time located in Colon instead of Panama City. Its call letters are HOLA and is reported from overseas as operating on 9505kc. and on the air from 10.35 am till noon. This one rebroadcasts the broadcast band station HOL, but up to the time of writing, we have not heard it out here.

A Dominican station has been heard on 6730kc., closing at 4 pm on Sundays, but call letters or station slogan was too hard to identify.

GERMANY. There are quite a number of stations operating in Germany under the control of the various occupation forces and we show below some of the addresses to which reports should be sent. British Forces Network, Hamburg, 7290kc. Major J. F. Bassett, R.A., No. 2 Field Broadcasting Unit, British Forces Network, British Forces of the Rhine. DYTC Munisch, 5302kc., A.P.O. 170, Munich, Germany. R.C.A. Berlin Press Centre, A.P.O. 755, c/o Postmaster New York City, N.Y., U.S.A. Austria gives us a new one on 6220kc., address being Dr. Siegmund Guggenberger, Argentinierstrasse 30A, Vienna. This station often takes a relay from Paris.

EIRE. Very few readers have been fortunate enough to receive their verifications from this country, so may be interested in the following item for which we are indebted to "Radio News." The station verified a report from Sweden in a letter which said: "It is desired to thank you for your communication relative to reception of the Irish S.W. Br. station and to confirm your reception reports. The Irish s.w. station, 1.5kw., transmits daily 3.40 am to 4 am on 17.840kc., and from 7.10 am to 8.30 am on 9595kc. We shall at all times be glad to receive reception reports from you." We managed to get our verification for 9595kc. many years ago but have had no luck with 17,840kc.

INDIA. The various stations of the All India Radio organisation are now very prompt in verifying reception reports and seem to take a real interest in them. We have just received ours for their 13-metre band transmission on 21,510kc. and were pleased to see it was their first report from Australia. This outlet, VUD8, is on the air more or less continuously from 1.15 pm until finally closing at 11.30 pm. VUM2 in Madras advised us that they will be using 6085kc. from 11.30 am to 1.30 pm, 9565kc. from 5 pm to 7.30 pm, and 8.30 pm to 9.30 pm, 4920kc. from 10 pm to 1.30 am, and 3435kc. from 1.45 pm to 2.30 pm.

NORWAY. We recently received our verification card from the Klofta experimental short-wave station on 6200kc. This station has the rather frightening name of Kortbolgekringkaster and, according to the card, closed down on September 1, 1946. They state that transmissions are now carried out by LKJ 9540kc., LKQ 11,735kc., and LLI 6185kc. the latter two being experimental. Times on the air are given as 8.45 pm to 10.30 pm and from 2 am to 8 am. Their card shows a very nice view on one side, while on the other the verification details are given in English. Address is Administration of Telegraphs, Radio Department, Broadcast Division, Oslo, Norway.

BEST BETS OF THE MONTH—TIME SCHEDULE

This chart for quick reference gives the call, frequency and listening times for the best stations on the air. Where the station is not at good level when it opens transmission, the time is given at which reception, under normal conditions, should be satisfactory.

6.0 am TO NOON

VLA9 21600kc Shepparton. This one is full speaker strength 11.0 am.
VLH5 15240kc National programme in excellent strength at 10.0 am.
WLWO 11790kc Cincinnati. Good level when it opens at 10.0 am.
KRHO 17800kc Honolulu. Always a good station towards Noon.
KNBA 17770kc Dixon. By 11.30 am is good entertainment level.
Dakar 15390kc Senegal. Nice level in the mornings at 7.0.
CKLO 9630kc Montreal. This Canadia easily logged at 6.30 am.
HOXA 15100kc Panama City. Still coming in nicely at 7.0 am.
WCBX 9490kc New York. Good station at breakfast time.

NOON TO 6.0 pm

KNBA 17770kc Dixon. At 2.0 pm this station is excellent strength.
HER5 11865kc Schwarzenbourg. Excellent Tues., Sats., at 6.0 pm.
KGEI 15130kc Belmont. Very good strength at 2.0 pm.
KGEX 15210kc Belmont. This one is nearly as loud at same time.
VLQ3 9660kc Brisbane. Excellent during afternoon.
FZI 11970 Brazzaville. Good signal in afternoon at 4.0.
GSB 9510kc London. Loud station at 5.0 pm.
VLR 9540kc Lyndhurst. Excellent in late afternoon.
GRX 9690kc London. Very loud outlet at 5.0 pm.

6.0 pm TO MIDNIGHT

VLR2 6150kc Lyndhurst. Good entertainment till midnight.
KRHO 9650kc Honolulu. Very good from about 8.0 pm.
KNBA 6060kc Dixon. Now a good station every night.
GSF 15140kc London. Excellent at 11 pm.
GRD 15450kc London. Another loud station at night.
Saigon 11780kc FIC. News in English at 8.0 pm.
Singapore 15275kc. Good entertainment strength at 9.0 pm.
GSV 17810kc London. Always a loud station at night.
Paris 15240kc France. Excellent nightly around midnight.

NEW S.W. STATIONS LOGGED

HERE are the details of new stations which have been heard during the past month.

ETHIOPIA. For nearly a fortnight we had been hearing a station on 15070kc. from just before midnight, but it proved very difficult to identify, as it had a peculiar fluttering effect, coupled with the fact that strength was not particularly good. However at last we identified it as Addis Ababa, in Ethiopia, when an announcement in English was given on one occasion at 12.40 am. The programme consists of both native and European type music, and there does not seem to be any set arrangement as quite often they are interspersed.

When we did hear the announcement it was quite plain and was given as follows, "This is Radio Addis Ababa. This is a new transmission, and is on the air daily from . . .? until 1500 GMT. Reports on reception are welcomed and should be addressed as follows, Deputy Director, Radio Services, Ministry of PTT, Addis Ababa, Ethiopia."

Here is a new one to go after and should be easily logged towards closing time, which is usually a few minutes before 1.0 am.

PHILIPPINE ISLANDS. Another new Phillippine station has taken the air, this being KZPI on 9710kc, which identifies itself as "Radio Philippine," and is owned by the Philippine Broadcasting Corporation.

It is heard best from around 9.0 pm nightly, but quite often suffers from Morse interference which makes it hard to copy. They take a lot of their broadcasts from local theatres and have quite a number of Amateur Hours which are quite funny at times. More than likely there will be a few more of these PI stations before long when they obtain new equipment. We first heard this one early in December, and it was then reported to us by Mr. Hart, of Mackay, Qld. but he gave it as being around the 20 metre band. We think Mr. Hart must be having a little trouble with double spotting on his receiver, unless the station was having transmitter trouble one night. We have found no trace of it ourselves except on 9710kc.

SENEGAL. African stations always seem to be interesting, as they are usually rather hard to log in this country, especially in the eastern States, but on occasions, there are some good signals. One of these is a new outlet for Dakar in Senegal, which has been heard for some time now from around 6.0 am, on a new frequency of 15390kc. On some mornings, strength is really excellent, and no difficulty should be experienced in identifying it, as there is a lady announcer who gives the call "Ici Radio Dakar" quite often. The station usually closes down around 7.0 am, but on one occasion at the weekend, it was heard until after 8.0 am, but was very weak at that time.

JAPAN. We are indebted to Sergeant E. K. Morehead of the BCOF, Kure, Japan, for details of the short wave station which has taken the place of WVTV, reported a couple of months ago. This station now uses the call WLKS, and operates on 6105kc from 7.30 am to 9.0 am, and also from noon until 7.0 pm. Previous call letters of this station were 9AT; G2B; and WVTV. This station also operates on the broadcast band on 1470kc ,and reports on reception would be appreciated and should be addressed to "Radio Station, WLKS," BCOF. Amenities Service, British Commonwealth Base, Kure, Japan. Many thanks Sergeant for the above information, as we know it will be of great interest to our readers, especially any of the returned chaps who have been up there with you.

CANADA. While listening to the Canadian station on 15090kc, one night, we were surprised to hear the call given as CBLX, as we thought it was the old station on this frequency CKLX. This new one is located in Montreal and carries the home programme from opening at midnight. Unfortunately the strong telegraph carrier which always seems to be on now near this frequency makes it difficult to understand, but if you listen carefully, you can log sufficient of their news bulletin to enable you to write for their verification. They must have an enormous mail at the CBC, as they take a very long time to verify now, anything up to seven or eight months.

PORTUGUESE CHINA. Mr. Rex Gillett was the first to tell of a new outlet for the Macau station, which can now be heard on 9250kc, but unfortunately suffers from strong Morse interference. We have now heard it from around 10.30 pm, and on the night we listened a news bulletin in English was given by a lady at 10.50 pm, concluding just before 11.0 pm. Chimes were then given and an announcement by a man clearly heard as "The Voice of Portugal in the Far East." Quality was poor as has always been the case with the Macau stations right back to the early days, when CQN was operating on the 49 metre band. It took months of steady listening to finally identify that particular station.

GERMANY. Our thanks are also due to Rex Gillett for identification of the new Munich outlets on 6100kc, 6170kc, and 7290kc. We had heard the first two for some time, but beyond the fact they were AFRS stations, Voice of America, &c., we could never get their location, as on the hour they cut off the speech circuit for a few seconds until time to take relay again. They can all be logged in the mornings from about 6.0, possibly earlier, and at our location the one on 6170kc, is by far the loudest.

MISCELLANEOUS. The Asharq al Adna station in Jaffa, Palestine, has now taken another channel into use, 11720kc, and is heard with the usual wailing type music around midnight. Incidentally they have now dropped the 6710kc channel, and now operate in 6170kc, but we have not heard them as yet, possibly owing to Munich.

The Macassar station is now using another frequency in addition to their normal one of 9260kc. The new one is 12320kc, and is heard in South Australia around 11.0 pm, but much weaker than the 32 metre band outlet.

Sourabaya is now operating on 16680kc, and is also heard around midnight announcing as "Hier Omroep Soerebaya." Another outlet which is definitely in the DEI, and possibly same location is heard at very good strength, just after midnight on 15490kc, when it plays records, all titles being given in English.

SHORT Wave Notes for the March issue are due by February 8. Those for the April issue are due by March 8. Send them direct to Mr. Ray Simpson, 80 Wilga-street, Concord West, NSW.

NEW STATIONS OF THE MONTH

Call	Kc.	Metres	Location	Time Heard.
MUNICH	6100	49.18	Munich, Germany	6.0 am.
WLKS	6105	49.14	Tokio, Japan	5.30 pm.
MUNICH	6170	48.62	Munich, Germany	6.0 am.
MUNICH	7290	41.15	Munich, Germany	6.0 am.
MACAU	9250	32.43	Macau, Portuguese China	11.0 pm.
KZPI	9710	30.90	Manila, Philippine Is.	9.0 pm.
SHARQ AL ADNA	11720	25.60	Jaffa, Palestine	Midnight.
MACASSAR	12320	24.35	Macassar, Celebes	11.0 pm.
ADDIS ABABA	15070	19.91	Addis Ababa, Ethiopia	12.30. am.
CBLX	15090	19.88	Montreal Q. Canada	1.0 am.
DAKAR	15390	19.49	Senegal, French W. Africa	7.0 am
SOERABAYA	16680	17.99	Soerabaya, Java	11.0 pm.

OVERSEAS S.W. STATIONS NOW AUDIBLE

The following stations have actually been heard in this country during the past month and the majority should be audible on a sensitive receiver. All times are Australian Eastern Standard Time.

AFRICA

CR7BF—4925kc. 60.91m. Lourenco Marques, Mozambique. This African can sometimes be heard around 4.30 am.

CR7AA—5863kc. 51.10m. Same location. Reported as a nice signal at 4.30 am, but weaker at 5 am.

CR7BJ—9650kc. 31.09m. Same location. This station is usually very good in the mornings at 6 o'clock.

CR7BD—15,230kc. 19.69m. Same location. Still heard on a Saturday afternoon, closing a few minutes before 4 pm.

Addis Ababa—15,070kc. 19.91m. Ethiopia. This is the new outlet heard about midnight until closing at 1 am.

Radio Algerie—11,835kc. 25.35m. Algiers, Algeria. Great signal from this one in the afternoons, opening at 4.30.

Algiers—6040kc. 49.66m. Algeria. Still being heard in the mornings until about 6 o'clock.

Algiers—9540kc. 31.45m. Same location. A morning station which has fluctuated a lot this last month between 6 am and 7 am.

Algiers—9610kc. 31.22m. Same location. The same remarks apply to this one.

FGA—11,715kc. 25.61m. Dakar, Senegal. Has still been heard in the afternoons, opening at 5.15.

Dakar—15,390kc. 19.49m. Same location. This is the new station mentioned in the notes this month.

FZI—6024kc. 49.80m. Brazzaville, French Equatorial Africa. Still being heard in the mornings at 6 o'clock.

FZI—9440kc. 31.78m. Same location. Usually quite a nice signal in the mornings around 7 o'clock.

FZI—9980kc. 30.06m. Same location. This is the better of the two stations on the 31-metre band.

FZI—11,970kc. 25.05m. Same location. Excellent in the afternoons and also heard in the mornings at 7 o'clock.

FZI—15,595kc. 19.23m. Same location. Seems irregular now, but has been heard early in the month at 10.30 pm.

OTM3—9370kc. 31.98m. Leopoldville, Belgian Congo. Comes in fairly well in the mornings at 7 o'clock.

OTC2—9740kc. 30.80m. Same location. This one has been really good in the mornings around 6.30.

OTC1—17,770 kc. 16.88m. Same location. A little better than last month around 11 pm.

ZNB—5900kc. 50.85m. Mafeking, British Bechuanaland. Reported as good signal in the mornings at 4 o'clock.

SUV—10,050kc. 29.84m. Cairo, Egypt. Mr. Kew, of Sydney, reports this one as a weak signal in mornings at 3.30

CNR3—9080kc. 33.04m. Rabat, French Morocco. Reported by some readers as heard in the afternoon after 4 o'clock.

VQ7LO—4950kc. 60.16m. Nairobi, Kenya Colony. Mr. Kew also hears this one in the mornings at 3.30.

Radio Somali—7125kc. 42.10m. Hargeisa, British Somaliland. Could hardly be identified at 1 am, but think it was Somali.

Tananarive—6065kc. 49.46m. Madagascar. Reported as a good signal in the mornings at 3 o'clock.

Tananarive—6140kc. 48.66m. Same location. This one is in parallel at the same time.

Tananarive. 9695kc. 30.96m. Same location. This old time outlet has been heard in the early morning at 1.30.

Tananarive—10,615kc. 28.26m. Same location. Another new outlet and heard at quite good strength in parallel with 9695kc.

No. 3—5883kc. 51.00m. Capetown, South Africa. Has only been logged on a few mornings until closing at 7 am.

CNR—16,660kc. 18.01m. Rabat, French Morocco. Heard by Ern. Suffolk and at our location at 11 pm.

CR7AA—6135 kc. 48.90m. Lourenco Marques, Mozambique. This old-time outlet heard by Rex Gillett at 6.30 am.

SOUTH AMERICA

CE622—6220kc. 48.23m. Santiago, Chile. Can still be heard on a good night at 10.0.

CE970—9730kc. 30.82m. Valparaiso, Chile. This one has again been logged at 11 pm.

CE1174—11740kc. 25.55m. Santiago, Chile. On a good night breaks through above the Russian on the same frequency.

CE1180—11,990kc. 25.02m. Santiago, Chile. Always one of the loudest Chile stations around 9.30 pm.

CE1190—11,900kc. 25.21m. Valdivia, Chile. Much weaker than it was a few weeks ago, after the American closes at 9.30 pm.

HCJB—9958kc. 30.43m. Quito, Ecuador. Quite a nice signal on most nights at 10.0.

HCJB—12,455kc. 24.09m. Same location. Have heard this one in the mornings at 7 o'clock and also on some nights.

HOJB—15,115kc. 19.85m. Same location. Very good indeed at our location from about 10.30 pm.

HCQRX—5970kc. 50.25m. Same location. Practically inaudible now when opening at 9.45 pm.

CXA19—11,835kc. 25.35m. Montevideo, Uruguay. Still the only one from this country and heard best in forenoon just before 9 am.

PRL7—9720kc. 30.86m. Rio de Janeiro, Brazil. Heard this one at the usual time of 1.30 am.

OAX4Q—6010kc. 49.92m. Lima Peru. Not heard often now, but on some Sundays stays on the air until 6 pm or later.

CENTRAL AMERICA AND WEST INDIES

HP5J—9607kc. 31.23m. Panama City, Panama. Quite often heard at night from around 10 pm.

HOXA—15,100kc. 19.87m. Same location. Really excellent at night at 10 o'clock, and also in the mornings at 7 o'clock.

TGWA—15,170kc. 19.78m. Guatemala City, Guatemala. Opens at very good strength at midnight and has also been heard at 6 am.

COKG—8920kc. 33.50m. Havana, Cuba. Heard by Miss Sanderson at 9.45 pm with news in Spanish and music.

COHI—6455kc. 46.48m. Santa Clara, Cuba. Also heard by the same listener at the same time.

HH3W—10,135kc. 29.6m. Port-au-Prince, Haiti. Usually a good signal and gives news in French at 9.30 pm.

COCX—9270kc. 32.36m. Havana, Cuba. Can usually be heard at 11 pm, and is sometimes better in the mornings at 8 o'clock.

TIPG—9618kc. 31.19m. San Jose, Costa Rica. Still not consistent, but when audible is usually at good strength.

NORTH AMERICA

13 Metres

WOOW—21,500kc. 13,95m. New York. Only a fair signal now around midnight.

WNRX—21,610kc. 13.88m. Same location. Quite easily heard every night at 11 o'clock.

WLWL—21,650kc. 13.86m. Cincinnati, Ohio. The Latin American programme can be heard in forenoon at 9.30.

KNBA/I—21,610kc. 13.88m. Dixon, Cal. Coming in nicely in the mornings at 9 o'clock.

16 Metres

KRHO—17,800kc. 16.85m. Honolulu, T.H. Always a nice signal from this one from around noon.

WNBI—17,780kc. 16.87m. New York. Heard in the forenoons with news and music directed to Europe.

WLWK—17,800kc. 16.85m. Cincinnati, Ohio. European programme at night around 11 but very weak at our location.

WLWL—17,955kc. 16.71m. Same location. This station carries the same programme at night.

KNBA/I—17,770kc. 16.88m. Dixon, Cal. The Hit Parade and news can be heard in the forenoon at good level.

KCBF—17,850kc. 16.81m. Delano, Cal. This is another of the West Coast stations heard well in the afternoons.

19 Metres

WRUA—15,130kc. 19.83m. Boston, Mass. The news in English can be heard every night at 9 o'clock.

WOOC—15,200kc. 19.74m. New York. Heard well at night around 11 o'clock with news and then music.

WNRE—15,280kc. 19.63m. Same location. In the European programme German is heard from this one at 10.15 pm.

WRCA—15,150kc. 19.81m. Same location. Can be heard at midnight and also in the mornings at 7 o'clock.

WBOS—15,210kc. 19.72m. Boston, Mass. One of the best on the band in the mornings at 7 o'clock.

WBOS—15,270kc. 19.64m. Same location. Have heard this one opening at 8.30 am.

WCBN—15,270kc. 19.64m. New York. The At Ease programme of music can be heard at 7.15 am. Also heard around 11 pm.

WRUS—15,350kc. 19.54m. Boston, Mass. America Speaks heard at 7 am. Very interesting programme.

WGEA/O—15,330kc. 19.57m. Schenectady, N.Y. This GE station is heard in mornings at 6 o'clock and also at 9 pm.

WRUL—15,290kc. 19.62m. Boston, Mass. Another Boston station which carries the European programme at night.

WLWR—15,250kc. 19.67m. Cincinnati, Ohio. This Crosley outlet carries the beam to Europe around 11 pm.

KCBR—15,330kc. 19.57m. Delano, Cal. The Adventures in Science programme heard in forenoons at 10.15.

KCBA—15,270kc. 19.64m. Same location. Heard in late December in the forenoons at 10 o'clock.

KCBA—15,240kc. 19.69m. Same location. The Hit Parade and The World in Review can be heard at 10.30 am.

25 Metres

WLWO—11,790kc. 25.45m. Cincinnati, Ohio. Quite nice level when it opens in the forenoon at 10 o'clock.

WOOW—11,810kc. 25.40m. New York. European programme gives us news in German at 10 pm.

WLWS—11,710kc. 25.52m. Cincinnati, Ohio. News in English heard well at 6.30 am.

WRUL—11,730kc. 25.57m. Boston, Mass. Cross Section and America Speaks can be logged daily at 6.45 am.

WCRC—11,830kc. 25.30m. New York. This station carries the same programme as above.

WNRA—11,790kc. 25.45m. Same location. The news in English is heard in the mornings at 8.15.

WLWO—11,710kc. 25.52m. Cincinnati, Ohio. Rather hard to follow this one, but heard every night around 11 o'clock.

WOOC—11,870kc. 25.27m. New York. Very good signal from this station in the mornings at 7 o'clock.

WGEA—11,810kc. 25.4m. Schenectady. Heard opening in the mornings at 8 o'clock in Portuguese programme.

WRUW—11,730kc. 25.57m. Boston, Mass. A programme in German is heard nightly from midnight.

KGEX—11730kc. 25.57m. Belmonth, Cal. The GI Jive session is heard at 7.30 pm.

KWID—1190kc. 25.18m. San Francisco, Cal. Usually a good station every night at 8.0, but much weaker than formerly.

KCBR—11810kc. 25.40m. Delano, Cal. Comes in nicely in the afternoons with music at 2.45.

KCBF—11770kc. 25.49m. Same location. Another Californian heard nightly at 7.30. pm.

KNBX—11790kc. 25.45m. Dixon, Cal. The United Nations Review is heard at 8.30 pm.

31 Metres

KRHO—9640kc. 31.09m. Honolulu, T.H. Very good signal from this Pacific station every night around 9.

WCBX—9490kc. 31.60m. New York. Good loud signal from this New York station every morning around 7.0

WLWO—9590kc. 31.28m. Cincinnati, Ohio. This station carries the Latin American programme at 7.0 am.

WLWL—9700kc. 30.93m. Same location. Another Crosley station which is audible every morning at 7.0 am.

WNRX—9750kc. 30.78m. New York. One of the N.B.C. stations which acrries the Eurooean programme in the mornings at 7.0 am.

WGEO—9530kc. 31.48m. Schenectady, NY. This General Electric station is heard every morning in Spanish between 8 and 9.0 am.

KGEI—9530kc. 31.48m. Belmont, Cal. Quite a nice signal every night around 8.30 pm.

KNBA/I—9490kc. 31.60m. Dixon, Cal. This Californian station is heard at very good strengt, every night from about 8.0 pm.

KCBA/F—9750kc. 30.78m. Delano, Cal. The Sports Review and music is heard well from this one at 8.30 pm.

KCBR—9700kc. 30.93m. Same location. A programme in Dutch and French can be heard at 9.15 pm.

WOOW—9490kc. 31.60m. New York. This C.B.S. station comes on at 8.15 am with a programme in French.

WRUA/S 9570kc. 31.35m. Boston, Mass. This World Wide Broadcasting Corp. station. also carries the programme in French.

49 Metres.

WRUA/S 6040kc. 49.67m. Boston Mass. Still very weak when they close at 3.0 pm.

WLWK—6080kc. 49.34m. Cincinnati, Ohio. The same remarks apply to this one and is quite often inaudible.

KNBA/I—6060kc. 49.50m. Dixon, Cal. Very good strength from this station at 8.0 pm, now being used regularly every night.

Between Band Stations.

WNRI—13050kc. 22.99m. New York. Can be heard at night around 11.0 pm, and also in mornings at 7.30 am.

WOOW—7820kc. 38.36m. Same location. Miss Sanderson hears this one in the mornings at 7.0 am.

CANADA

CHOL—11720kc. 25.60m. Montreal, Que. Always seems to be at good strength in the mornings at 7.30.

CKLO—9630kc. 31.15m. Same location. This 31 metre band outlet again in use and heard well at 7.30 am.

CKCX—15190 kc. 19.75m. Same location. Heard at fair strength, opening at midnight.

CKNC—17820kc. 16.84m. Same location. This one opens at the same time, but is very weak at our location.

CKCS—15320kc. 19.58m. Same location. On some occasions this one is quite good at 6 am.

CKRA—11760kc. 25.51m. Same location. This one has been heard in a programme for the West Indies at 11am, but very weak.

CBLX—15090kc. 19.88m. Same location This is the new station mentioned and heard on some nights at 11.

CFRX—6070kc. 49.42m., Toronto, Ont. Better than last month, and easily heard at 11 pm.

CBRX—6160kc. 48.70m. Vancouver, BC. This West Coast Canadian is really good on some mornings at 1.30.

MEXICO

XEWW—9500kc. 31.58m. Mexico City. Possibly the best Mexican and heard at 4 pm and also at midnight.

XEBT—9625kc. 31.17m. Same location. Usually heard fairly well in the afternoons at 3.30.

XERQ—9615kc. 31.21m. Same location. Miss Sanderson hears this Mexican at good strength at 3.45 pm.

XEHH—11880kc. 25.25m. Same location. This comparatively new one heard again sometimes at midnight but not in afternoons.

XDY—9924kc. 30.23m. Chapultepec. Quite good level from this one, with a news session from 1 am till closing at 1.30 am. (Rex Gillett has their verification.)

XEQQ—9680kc. 30.99m. Mexico City. Has again been heard, opening at midnight, at quite good strength.

INDIA AND ASIA

XOPB—9550kc. 31.41m. China. Location possibly Hangchow, and heard with Chinese programme at 10 pm.

XMTA—12210kc., 24.56m. This is Changsha, we think, and heard well every night at 9 o'clock.

XGTA—11650kc. 25.73m. This is another Chinese heard quite well around 8.30 pm.

XGNC—9620kc. 31.17m. Still another of these difficult stations with Chinese programmes at 9 pm.

XGOY—11915kc. 25.18m. Chungking. Really good strength nightly around 9.

XGOA—9730kc. 30.82m. Chungking. Very difficult to follow, but usually there around midnight.

XORA—11680kc. 25.68m. Shanghai. Some nights is fairly good at 9, but not very interesting.

XGOY—6140kc. 48.86m. Chungking. The news in English can be heard from this one at midnight.

SEAC—6075kc. 49.38m. Colombo, Ceylon. Very hard to follow now, and is much weaker at night.

SEAC—7185kc. 41.75m. Same location. The programme for England is still being heard on Mondays at 6 am.

SEAC—11770kc. 25.49m. Same location. The Forces Broadcasting Station, again using this frequency, and news heard at 1 am.

SEAC—15120kc. 19.84m. Same location. Quite good level from this outlet every night around 9.

SEAC—21470kc. 13.97m. Same location. Used in Test Match session in afternoons around 5.

KZRH—9640kc. 31.10m. Manila, Philippine Islands. Still coming in nicely every night around 9.

KZPI—9710kc. 30.90m. Same location. New station, which is heard every night, as mentioned in the notes.

Singapore—11735kc. 25.56m. Quite a steady signal from this one, but the Russian interferes slightly.

Singapore—15275kc. 19.64m. Improved from last month, and provides a good signal around 9 pm.

Singapore—15300kc. 19.61m. Used in parallel, but not nearly as loud as the other outlet.

Saigon—11780kc. 25.47m. French Indo China. Not as loud as a few weeks ago, but always audible around 9 pm.

Sharq al Adna—11720kc. 25.60m. Jaffa, Palestine. New outlet for this station and heard at midnight.

Shard al Adna—6135kc. and 6170kc. 48.9m. and 48.62m. These two outlets are used in parallel with 11720kc.

Rangoon. 6040kc. 49.67m. Burma. Not as loud as previously and not interesting, as carries native-type programme.

Rangoon—9540kc. 31.45m. Same location. Very nice signal from this outlet and English heard at 1 am.

Kuala Lumpur—6175kc. 48.58m. Selangor. Still coming in nicely around 11 pm.

Macassar—9250kc. 32.43m. Celebes. Still being heard reasonably well every night around 10.

Macassar—12320kc. 24.35m. Same location. This is another outlet first reported by Rex Gillett, as heard around 11.30 pm.

Soerabaya—16680kc. 17.99m. Java. DEI. Another new one, reported first by Rex Gillett and heard around 11 pm.

HS8PD—5990kc. 50.08m. Bangkok, Siam. Very noisy now, and not interesting when heard at 10 pm.

JKC—6015kc. 49.88m. Tokio, Japan. Usually one of the best on this band till closing at 12 midnight.

JLW—9505kc. 31.57m. Same location. Heard every night at quite good strength around 8.

Tokio—4950kc. 60.61m. This one, which is an AFRS station, is heard in parallel with JKC until closing at midnight.

VUD8—2150kc. 13.95m. Delhi, India. Very nice signal in the afternoons and also late at night.

VUD10—17830kc. 16.82m. Same location. Excellent every forenoon, when it reaches very good level.

VUD11—7290kc. 41.15m. Same location. Another good Indian heard regularly at midnight.

VUD8—7210kc. 41.61m. Same location. The news in English is heard at good strength at 12.30 am.

VUD9—11870kc. 25.57m. Same location. One of the best Indians at night and also gives news at 12.30 am.

VUD7—15160kc. 19.79m. Same location. Loud station from around 8 pm, but native-type music.

EUROPE

HER3—6165kc. 48.66m., Schwarzenbourg, Switzerland. This outlet now seems discontinued in the early morning.

HER5—11865kc. 25.28m. Same location. Really excellent on Tuesdays and Saturdays, directed to Australia. Closes at 7.30 pm.

HBJ—12965kc. 23.14m. Prangins, Switzerland. Used in parallel in the programme directed to Australia, NZ and the Orient.

HER7—17784kc. 16.87m. Schwarzenbourg. Heard on Mondays only in programme to the Orient, opening at 6 pm and closing 6.30 pm.

HE15—11715kc. 25.61m. This one comes in nicely at 1 am on Saturdays, in programme beamed to the Orient.

HER6—15030kc. 19.60m. The African programme can be heard from this outlet when it comes on the air at 1 am on Sundays.

HE14—9539kc. 31.45m. Have heard this outlet on a few occasions, closing at 1 pm, but it is very weak at this time.

HE13—7210kc. 41.61m. This outlet has been heard weakly at 10 pm, but hopelessly mixed up with the Indian on same frequency.

TAP—9465kc. 31.70m. Ankara, Turkey. This one is always heard at good strength in the mornings at 7.

Luxembourg—6090kc. 49.26m. Very hard to log this European now, as the noise on the band is severe in the mornings.

Belgrade—9420kc. 31.85m. Yugoslavia. Hard to follow now in the afternoons around 5 o'clock.

Radio Andorra—5980kc. 50.02m. This station is now also very hard to follow in the mornings, due to high noise level.

LKJ—9540kc. 31.45m. Oslo, Norway. Can be heard opening at 8.45 pm weakly, and frequency is nearer 9537kc. Lady and gent. announce.

AFN—6100kc. 49.18m. Munich, Germany. Heard every morning around 6 am at fair strength. Rex Gillett first to identify this one.

AFN—6170kc. 48.62m. Same location. Carries the same programme as on 6100kc and usually at better level at our location.

AFN—7290kc. 41.15m. Same location. Another of these AFRS stations in chain with the two mentioned above. This one is weakest.

Berlin—9730kc. 30.83m. Germany. This one or Leipzig can be heard both in the mornings and afternoons at quite good strength.

Warsaw—6114kc. 49.06m.. Poland. Hard to log this one now, but on a good morning the news in English is heard at 6.30 am.

Brussels—17840kc. 16.82m. Belgium. Improved since last month, and at the week-end is heard in the afternoons till around 4 pm.

Madrid—9370kc. 32.00m. Spain. One of the best on this part of the dial and carries some good programmes around 6.30 am.

Radio Rodina—9350kc. 32.09m. Sofia, Bulgaria. On a good morning the news in English can be heard from 6.30 am till 6.40 am.

Milan—9630kc. 31.15m. Italy. Comes in nicely in the mornings, and has some really good musical numbers, including opera.

OIX2—9503kc. 31.57m. Lahti, Finland. Can still be heard in the mornings at 6 am, and has also been logged late at night.

CIX4—15,190kc. 19.75m. Same location. This outlet heard in the afternoons at 5 pm and in parallel with OIX2 at night.

HVJ—15095kc. 19.87m. Vatican City. Quite a nice signal from this station in the mornings at 1 o'clock when English is heard.

HVJ—9660kc. 31.06m. Same location. A talk in English can be heard at 4.15 am, but is not very loud at that time.

HVJ—5968kc. 50.27m. Same location. Have heard this outlet in parallel with 15095kc at 1 am, giving Papal message.

SDB2—10780kc. 27.83m. Motala, Sweden. The best time to hear this Swedish station is in the mornings at 6.

SBP—11705kc. 25.63m. Same location. Possibly on during the week as well, but always heard on a Sunday afternoon from about 5.

SBT—15155kc. 19.80m. Same location. The 19-metre band outlet is used in parallel with SBP in the 25-metre band at same time.

OLR4A—11840kc. 25.34m. Prague, Czechoslovakia. Listen for this one in the mornings before 6, when strength is fair.

OLR5C—15160kc. 19.79m. Same location. Heard this one for the first time in years, opening weakly at 1 am, with musical notes.

CSW6—11040kc. 217.17m. Lisbon, Portugal. Have had no reports of this one, but still heard at our location at 6 am.

CSX—6370kc. 47.10m. Same location. The noise spoils what used to be a loud station in the mornings from about 6 am.

Paris—15240kc. 19.69m. France. Excellent strength from this outlet at midnight and until closing at 12.30 am.

Paris—15350kc. 19.54m. First time we have heard this frequency in use and comes in at same time as 15240kc, but a little weaker.

Paris—9520kc. 31.51m. Quite loud in the mornings at 7 am, as long as you can separate it from nearby stations.

Paris—17765kc. 16.88m. Hard to separate this one from the other stations on this part of the band, but usually audible 11 pm.

PCJ—9590kc. 31.28m. Hilversum, Holland. Still being heard in the mornings at 6 am, at quite good strength.

PCJ—11730kc. 25.58m. Same location. Another Netherlands station heard in the mornings at 7 am, at good strength.

PCJ2—15220kc. 19.71m. Same location. One of the best stations in this band around midnight.

PCJ—17770kc. 16.88m. Same location. Jammed right alongside Paris around 11.30 pm, and very hard to hear clearly.

PHI—6023kc. 49.82m. Same location. This one has not been heard at 6 am, but heard one Sunday morning closing at 1 o'clock.

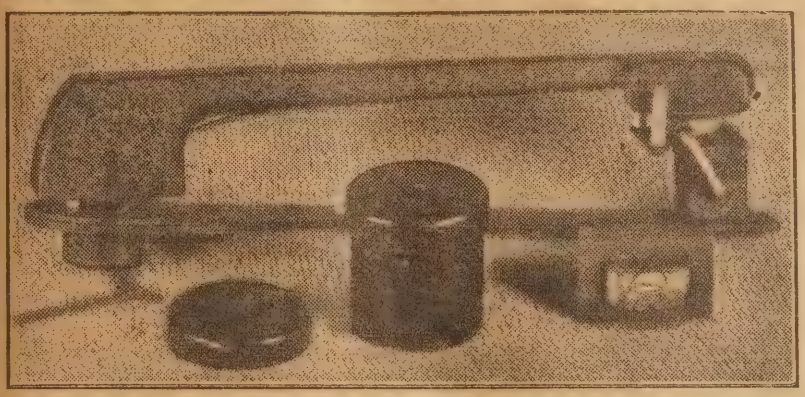
Moscow—15340kc. 19.56m. USSR. Programme in English heard at night at 10.30.

Moscow—11630kc. 25.80m. USSR. The same programme as on 15340kc is heard on this frequency at the same time.

Azores—11090kc. 27.05m. Ponta Delgado, Azores. Heard this one in December, but think has now moved to 41-metre band.

OFF THE RECORD — NEWS & REVIEWS

ENGLAND'S NEW CROP OF PICK-UPS



The Lexington pickup with its special protective head rest, which also contains an automatic device for needle insertion. The 50-1 coupling transformer and its mu-metal case are also shown.

A few months ago, I mentioned something about the new types of magnetic and dynamic pick-ups which were appearing on the English market. The inference is that they are being prepared for use with the new technique of high fidelity recordings, many examples of which have already been issued overseas.

WE have received from England the technical details of the Lexington pick-up, which appears to be a good example of what might be expected from these new developments. It will be remembered that, just before the war high-grade magnetic pick-ups were being produced in England and elsewhere, but this is the first sample of a moving-coil type we have come across.

As will be seen from the curve shown here, the frequency response of the pick-up is substantially flat—also the output is not quite as high as the average magnetic type, although high enough for use with amplifiers having a good measure of gain. As a rule, however, a pre-amplifier will probably be found desirable, and one having an appropriate degree of bass boost.

The makers claim that high-grade pick-ups today are of either the condenser, velocity ribbon, photo-cell, or moving coil types, and claim that the harmonic distortion of the Lexington is negligible over a frequency range of 30-12,000 cycles.

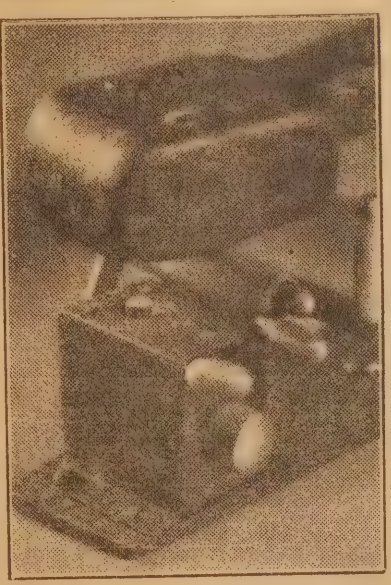
The pick-up has a novel chuck to accommodate either sapphire-pointed needles, or special chromium types both keyed so that they cannot be rotated in the chuck. This is quite a point in connection with sapphires, which are apt to damage records if the slightly worn edges are allowed to rotate after an appreciable number of playings.

In order to avoid damaging the pick-up when inserting the needles, they are first of all placed in a receptacle in the pick-up base immediately below the head, and held in place by the "pincer" arms, which grip them firmly. The head is then lowered on to the needle shaft and pressed into place.

Our tests with this pick-up revealed its ability to produce very clean reproduction. As may be expected, needle scratch with ordinary records is reproduced at a somewhat higher level than with the average pick-up, but with modern pressings this would not be so noticeable. No bass boost was available at the test, but indications were that the very good quality bass response would require reinforcement with a tone-control pre-amplifier stage for average use.

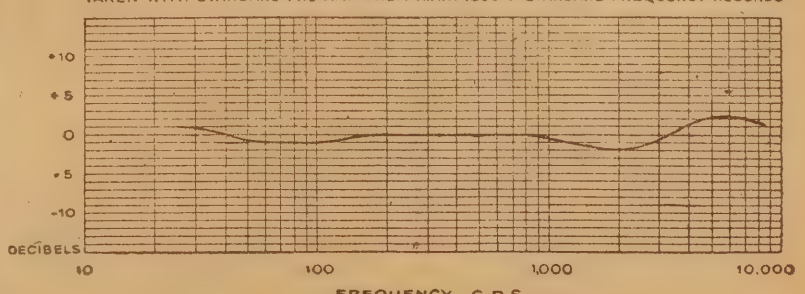
In fact, it can be said that pick-ups of this type are suitable particularly for the amplifier "specialist," who requires the very best, and, therefore, should really be built as part of his equipment rather than being tacked to the pick-up terminals of an existing set.

The pick-up is provided with a shielded matching transformer giving a fairly high step-up ratio.



Above—A close-up of the head rest.
Below—Manufacturers response curve.

CURVE OF LEXINGTON MOVING COIL PICK-UP
TAKEN WITH STANDARD PRE-AMP FROM H.M.V. 4036-7 STANDARD FREQUENCY RECORDS



Record Reviews

HAROLD IN ITALY (BERLIOZ). PLAYED BY THE BOSTON SYMPHONY ORCHESTRA, WITH WILLIAM PRIMROSE (VIOLA) AS SOLOIST. CONDUCTED BY KOUSSEVITSKY.

This is a highly interesting recording—a "first" by the way—of the almost uniformly brilliant Berlioz fantasy on the Childe Harold journeyings of Byron's poem. It is, of course, programme music of a fairly definite character, the movements being "Harold in the Mountains—Scenes of Melancholy, Happiness, and Joy"; the second "March of the Pilgrims Singing the Evening Hymn," then "Serenade," and lastly, "Brigand's Orgy."

The choice of a viola as symbolic of Harold himself, if it can be expressed that way, was quite a stroke on the part of the composer, for this instrument is capable of a peculiar intimacy all its own. The soloist, as might be expected, does a magnificent job, his instrument maintaining a thread in the orchestral pattern even more effective than would have been the human voice itself.

This is a brilliant recording, with plenty of lift and flexibility. The final side contains Elgar's "Serious Doll."

BALLADE FOR PIANO AND ORCHESTRA (FAURE). PLAYED BY KATHLEEN LONG AND THE NATIONAL SYMPHONY ORCHESTRA, UNDER BOYD NEEL. DECCA Z 862-3.

This Ballade has four movements which run straight ahead, and one could almost imagine it as a solo piano work, so pronounced is the role of the piano. The music is typical of Faure—it is musical, smooth, delicately turned, and altogether easy to hear. It is ideally suited to a woman pianist, even more so than that of Franck, who is, I think erroneously, often considered to be a "natural" for the ladies.

We have had released quite a bit of Faure of late, and if the standard of these records is maintained, we could do with more of it.

JOHN FIELD SUITE (HARTY). PLAYED BY THE LIVERPOOL PHILHARMONIC ORCHESTRA, CONDUCTED BY SARGENT. COLUMBIA DOX814-6.

Apparently this suite draws upon the music of the Englishman, John Field, reputed inventor of the Nocturne. I'm not an authority on this composer, but I'd say he shares the honors with Harty, whose arrangements always exhibit imagination and freshness, with Sargent, who does this type of thing very well, and with the orchestra which has already made a place for itself in the recording field.

The Rondo movement I found the most attractive, although the general standard throughout is good. So is the recording—a well-balanced, nicely defined effort.

DER FREISCHUTZ OVERTURE (WEBER). PLAYED BY THE PHILHARMONIC ORCHESTRA UNDER SUSSKIND. COLUMBIA DOX817.

This overture has always been something of a favorite with me, and as a result, I may be pardoned for suggesting that it could perhaps have been taken with a little more enterprise and vigor. It is quite competently played, but rather on the up and down pattern.

I could not help comparing it with the really fine Beecham recording of "Oberon" the other star Weber overture. In his ability to turn a phrase with the finest of timing, and his marvellour judging of comparative pace, Beecham can provide a lesson for almost any conductor loving today. These things I feel could have been added to this new record with advantage.

(Continued on Page 74)

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At the same time, it has some good moments, and is a somewhat better recording than the older Boston Prom. record released some years ago. Definitely worth a hearing.

"SEMPRE LIBERA"—"AH! FORS E LUI"—TRAVIATA (VERDI). SUNG BY JOAN HAMMOND WITH PHILHARMONIC ORCHESTRA UNDER SUSSKIND. HMV EB360.

If you are one of Joan Hammond's many admirers, you will probably vote this pretty well her best record to date. She handles the difficult passages with success, and the general standard of recording does justice to all concerned.

My own reaction is simply that she is up against big competition in these two famous arias, and her competitors, in many cases, have the advantage of singing in Italian, and moreover, don't sound so very healthy and completely vital as does Joan. There is a certain hint of fragility required for the part of Violetta, rather than a robustness, which makes Joan a reasonably good singer of Wagner. But apart from this, which, as I have said, is largely personal opinion, the record should enhance her recording reputation.

DANSE MACABRE (SAINT SAENS)—DON JUAN'S SERENADE (TCHAIKOWSKY. SUNG BY NELSON EDDY. COLUMBIA DO2931.

These are sung in French and, I am afraid, are more vehicles for the Eddy vocal chords than anything else. Don Juan sounds more like a big brother to me, unless, of course, that's one of the approaches. And the Danse Macabre has long ceased to register. But the recording is fine.

ESTUDIANTINA WALTZ (WALDTEUFEL) PLAYED BY THE BOSTON PROMENADE ORCHESTRA UNDER FIEDLER. HMV EA3420.

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Noteworthy records issued this month are:

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FRANKIE CARLE AND HIS ORCHESTRA —"I'd be lost Without You" and "I'm Gonna Make Believe." DO.2934.

DINAH SHORE WITH ORCHESTRA — "Laughing on the Outside (Crying on the Inside") and "Two Silhouettes." DO.2935.

VICTOR SILVESTER & HIS BALLROOM ORCHESTRA—"Cynthia's in Love" and "Seven Days a Week." DO.2936.

FRANK SINATRA, Vocal with Orchestra— "I fall in Love with you Ev'ry Day," and "Something Old, Something New." DO.2937.

REGAL ZONOPHONE

BARBARA AND REG (Barbara James, Vocal—Reg. Lewis, Piano) WITH THEIR RHYTHM—"I am counting the Beads of my Rosary" and "You're so Lovely." G.25073.

SHIRLEY THOMS (Australia's Yodelling Sweetheart)—"Why did you Make Me Love You?" and "Cabin in the Pines." G.25072.

DECCA

THE MILLS BROTHERS, Vocal, With Guitar—"Don't by a Baby, Baby" and "Never Make a Promise in Vain." Y.5990.

BING CROSBY Vocal, with Ethel Smith and the Song Spinners.—"Mighty Lak' a Rose" and "The Sweetest Story Ever Told." Y.5989.

PARLOPHONE

GERALDO AND HIS ORCHESTRA—"Seems Like Old Times" and "Amado Mio." A.7568.

HARRY ROY AND HIS BAND—"Kiss Me Hello" and "Southpaw Special." A.7569.

GERALDO AND HIS ORCHESTRA—"Day by Day" and "Patience and Fortitude." A.7570.

THE ORGAN, THE DANCE BAND AND ME—"When Two Broken Hearts Get Together" and "Let By-gones be By-gones." A.7571.

H.M.V.

TOMMY DORSEY AND HIS ORCHESTRA "Remember Me" and "Any Old Time." EA.3430.

JEAN CAVALL WITH ORCHESTRA — "The Kiss of Romance" and "Paris in my Heart." EA.3431.

ARTIE SHAW AND HIS GRAMERCY FIVE —"The Grabtown Grapple" and "The Sad Sack" Artie Shaw (Clt.); Roy Eldridge (Tpt.); Dodo Marmarosa (Pho.); Barney Kessel (Gtr.); Louis Fromm (Dms.); M. Rayman (Bass).

ANNE ZIEGLER AND WEBSTER BOOTH —"Love Steals Your Heart' and "Love's Garden of Roses." EA.3426.

TOMMY DORSEY AND HIS ORCHESTRA —"Love is the Darndest Thing" and "That Little Dream Got Nowhere." EA.3427.

TEX BENEKE WITH THE MILLER ORCHESTRA—"Cynthia's In Love" and "I Know." EA. 3428.

DUKE ELLINGTON AND HIS ORCHESTRA —"Moon Mist" and "The 'C' Jam Blues" Duke Ellington (Pno); Otto Hardwick, Johnny Hodges, Ben Webster, Harry Carney, Barney Bigard (Reeds); Rex Stewart, Wallace Jones (Tpt); Ray Nance (Tpt & Vln); Joe Nanton, Juan Tizol, Lawrence Brown (Tmb); Fred Guy (Gtr); Sonny Greer (Dms); Alvin Raglin (Bass).

MAKING YOUR CHASSIS

(Continued from Page 53)

the same angle. The job will look neater and you may save the temper of the press operator who makes your chassis.

Don't forget the holes for the grid lead alongside some audio valves, the holes for leads beneath the tuning gang, the padder mounting, and, finally, the terminal and speaker mounting holes along the rear edge of the chassis. They are all so easily forgotten unless you have been caught out before.

Flanges will normally be bent outwards so that, if you want them turned inwards, clearly mark your drawing that way or add a small free-hand perspective sketch.

An accurate drawing is essential before any press operator can turn out the desired chassis. If the original drawing is inadequate, the chassis manufacturers may either delay the job or else have his draughtsman redraw the plan and charge you accordingly.

To round things off, we asked a well-known manufacturer's representative for his comments and ideas about designing a chassis. Here are his remarks, exactly as they were presented to us:

1. Make your drawing to full scale, that is, the size you want it to be, and in flat or "exploded" view. White or smooth brown paper are excellent mediums for the drawings; cardboard, crumpled advertising calendars and backs of envelopes should be avoided. It is not necessary to use ink, but the drawing should be legible. As long as the centres of all holes are marked and sized, the outline may be only approximate.

2. Try to keep sides and folds parallel and square—steel is not cut on the bias.

3. Always bear in mind that the tradesman making your chassis, although trained in radio, is not a thought reader and only what you show will be in the job.

4. In the case of amplifier covers and boxes, a perspective drawing with ALL measurements shown will get by. If space is at a premium or the cover must fit a completed chassis, give outside sizes, as the manufacturer will assume outside sizes unless otherwise stated.

5. State what finish you require:—Duco, brocade, cadmium plate or what have you. Put your name on your template and leave it with one of the regular radio supply houses.

PLASTIC OYSTER SHELLS

SUBSTANTIAL economy in shipping oysters is reported through the use of plastics cases for the succulent bi-valves after they have been removed from their heavy natural shells. The idea is to remove the oyster from the shell and immediately place it in a lightweight plastics duplicate of the shell.

Thus it is planned to ship to remote points only good looking half shells and to leave all other shells as near the point of origin of the oysters as possible.

A SHORT WAVE RECEIVER

(Continued from Page 49)

The 956 RF amplifier is mounted alongside the bandspread gang with a lead coming up through the chassis to the plate connection.

The ECH35 converter is mounted immediately behind the 956 with the first IF transformer alongside it. This feeds into the 6U7-G first IF amplifier and then the second IF transformer.

Along the rear of the chassis we have the third transformer, then the 6U7-G amplifier, a fourth IF transformer, the blank socket and then the 6G8-G, 6H6 and 6V6-G.

POWER SUPPLY

The power supply components are in front of the audio valves, with the BFO coil, valve and control in the front corner of the chassis remote from the IF amplifier channel.

Viewing the receiver from the front, the two doublet aerial terminals and the earth terminal are to the left of the panel. The main tuning dial is of wartime design with a numerical scale and so arranged that a strip of cardboard for hand calibration can be slipped down behind the front glass.

Perhaps a better type of dial to use would be one with a horizontal pointer movement, modified in some way to allow for hand calibration. Actually any smooth vernier type will do, provided it fits neatly into the panel layout.

A tuning meter is mounted to the right of the dial and a couple of oddment angle brackets from a 108 transceiver were added to keep the panel rigid.

Along the bottom of the panel the switch on the extreme left is the "Standby" switch, wired into the high tension centre-tap return. To the right of this is the I.F. gain control and the noise limiter control. Then follows the band switch, tuning and volume, and the band set control.

The vernier drive for the band set condenser was adapted from a 108 transceiver and gives a reduction ratio of about 4 to 1. A spot of elementary fabrication with scrap brass and celluloid produced two matching pointers, one fitted to the band switch and the other to the bandset dial mechanism. A numerical scale was drawn directly on the front panel in black enamel for the bandset condenser, with a design to balance for the band switch.

PANEL SYMMETRY

It is a matter for yourself whether you go to this trouble to achieve symmetry of panel layout, but it is most important that you have an accurate drive and reference scale for the bandset condenser, otherwise it cannot be brought immediately to any pre-determined setting.

To the right of the bandset knob is the tone control, BFO control and phone jack. The BFO condenser is an 11-plate midget and the tip of one moving plate is bent so that the condenser shorts out and renders the BFO inoperative when turned to one extreme position.

When the layout was fixed, and before the panel was attached, it was lettered in black enamel with a lettering pen to avoid confusion between the various knobs. With a little care, quite a reasonable job can be made working quite freehand.

From the photographs and the foregoing outline, it should not be any problem for the experienced amateur to select suitable components and mount them on the chassis. Some additional work may be necessary with drill and file, but that is only to be expected under the circumstances. Plan carefully, think ahead, and mount everything to allow the shortest leads. It is just as well to do as much of the mechanical work as possible at the outset.

In wiring a big set like this, our personal preference is to begin at the loudspeaker and gradually work backwards, getting each stage into operation before proceeding with the next. Problems or errors can then be rectified as the work proceeds.

WIRING UP

Thus, one can begin by wiring up the power supply and audio output system, installing the voltage divider at the same time. The set can then be switched on and the audio section tested with any available signal source. Check on the operation of the loudspeaker, the earphone jack and standby switch.

Next, add the noise limiter stage and the audio voltage amplifier, testing these and correcting any faults which may have occurred.

After that, add the I.F. amplifier stages, putting in all the wiring and components as you go, and working forward to the plate pin of the converter valve. At this stage, the I.F. transformers can be aligned in preliminary fashion, screen voltage set and the operation of the gain control and tuning meter checked. Incidentally, if your meter has a sensitivity of between one and 10 milliamps full scale, it will be necessary to make up, or have made up, a suitable shunt to bring it to a 10 milliamps full scale reading.

PLACEMENT OF LEADS

In wiring the stages to this point, we followed the plan of keeping all wires and components well towards the side and rear of the chassis. You will find that plenty of working space is needed when it comes to adding the coils and the components which necessarily have to be grouped with them.

In the original set, the earthing busbar, heater wires and the various other leads were run just in front of the sockets along the rear of the chassis. As many of the components as could be so arranged were connected directly between socket points, but not protruding forwards into the space to be occupied by the coils and tuning condenser.

Most of the resistors and condensers to do with the AVC, detector and noise limiter circuits were mounted

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on small mounting strips (also from a No. 11 transceiver) and attached to the rear of the chassis. These are not seen to advantage in the underneath photograph, since they edge on to the camera.

Having got thus far with the construction and testing of the set, it is just as well to complete the wiring to the converter valve and R.F. amplifier, instal the switch and have everything ready for the addition of the tuning coils.

SHORT LEADS

Think initially in terms of the highest frequency band and place the switch to allow the shortest possible leads from the valve sockets, through the switch to the windings of the coil. Then begin by winding up the set of coils which will be in the most inaccessible position. In our case, this applied to the small coils for the 10-metre band.

Following the data to the letter, wind the coils, dope them and leave to dry. When dry, mount them in position by small brackets, or by any other means you may by this time have figured out.

We punched a small slot through each side of the formers with a gramophone needle, then looped and bent through it an ordinary single-ended solder lug. If the "tail" portion is squeezed and soldered, the "eye" can be bent out at right angles to form a very simple but satisfactory lug.

Wire the coils to the switch, covering the fine wires with 1-mil. spaghetti tubing to add rigidity. Remember that the "cold" end returns of the coils are just as important as the other ends. The AVC bypass, B-plus bypass and padder condensers should be mounted right near the coils or, indeed, on the coil brackets themselves.

Earth return points should likewise be centralised. We took the extra step of interconnecting the rotors of the two tuning condensers, the earth returns for the coils and the cathode returns of the first two valves with copper braiding stripped from shielded wire.

If the coil data are followed to the letter and every care taken to avoid unnecessary minimum circuit capacitance, the band coverage should work out much as in the original set. It is a grand help if an accurately calibrated oscillator or signal generator is available but, failing that, one can only rely on the signals received to gain some idea as to whether or not the receiver is covering the desired frequency range.

Screw the oscillator trimmer in to about one-third of its capacitance, set both tuning condensers to minimum or near minimum capacitance and peak the aerial and RF trimmers for maximum output. This can often be done best on background noise alone, particularly on the interference provided by an electric drill, buzzer, or other device which gives a helping of noise over the band.

ALIGNING ON NOISE

Alignment on noise is especially helpful in the 30 megacycle region, since the inevitable pulling effects in the converter valve are not so apparent. Two peaks may be evident in the aerial and RF trimmers, but choose the one with the trimmers towards maximum capacitance. The coils have been designed to allow the oscillator to operate at a frequency higher than the signal frequency.

Having peaked the trimmers, rotate the bandset condenser through the limits of its travel. Sensitivity may taper off towards maximum capacitance, but there should be no marked regions of silence or spots where the receiver tends to be unstable. Such would indicate that the coils are tracking badly, or that the signal circuits are crossing over the oscillator frequency.

If such trouble does occur, and ordinary alignment procedure or moderate compromise does not stop it, the only possible course is to experiment with the coils and padder capacitance. A higher or lower value of padder may correct the tracking. If it doesn't, try adding or removing half a turn from the oscillator coil and checking again. It is certainly a tedious job but we had to do it to arrive at the data presented with the article.

OTHER BANDS

When the first band is behaving as it should, and certainly not before, wind up the next set of coils and repeat the procedure. After that, the third set of coils can be tackled in similar fashion.

We have already explained at the beginning of the article how a compromise arrangement was adopted to cover the 80-metre amateur band. But, if you are keen to wind up a fourth set of coils to cover from 3 megacycles downwards, you will not go far wrong by putting on say, twice the number of turns on all windings, as for the 40-metre coils, perhaps reducing the gauge slightly to limit the bulk of the coils.

That just about completes the story of the set for the time being. Its construction will commit you to a lot of work and require a deal of patience and skill, but the final result will be well worth while.

As time progresses we will doubtless have occasion to experiment and modify the original set and due space will be devoted to points of interest which may arise therefrom.

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THE PRINCIPAL (R.H.) (247)
AUSTRALIAN TECHNICAL SCHOOLS,
ASSEMBLY HALL, JAMIESON STREET, SYDNEY.

I am interested in Diesel Engineering. Please send me your FREE BOOKLET, giving details of your Correspondence Course in DIESEL ENGINEERING and Special Offer.

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ANSWERS TO CORRESPONDENTS

UNDER THE PERSONAL SUPERVISION OF THE TECHNICAL EDITOR

WE read this letter over a couple of times and passed it around the staff as a boost to our collective morale. At last, we thought, we have found the perfect reader:

"For over seven years I have been going to write you expressing my appreciation of your fine periodical 'Radio & Hobbies,' but I have kept putting it off.

"Recently I was called upon to construct for a friend, a one-valve battery receiver, for headphone reception and employing a 6A6 valve which my friend had on hand. On looking through my 'library' of 'Radio & Hobbies' I came across, in the very first issue (April 1939) Little Jim which was exactly what I wanted.

"That incident set me thinking, and my thoughts were as follows:—For the past seven years I have been getting "Radio & Hobbies" and have built the greater majority of the sets described. I needed a modulated oscillator and found the ideal job for the purpose in the August '41 issue. I needed a good short wave receiver early in 1940 and found what I wanted in the May '39 issue. Only last month I decided to build a small Mantel set for use around the house and the Little General (January 1946) suited my purpose admirably.

"Well, I thought, you're a lousy sort of joker, 'Radio & Hobbies' has helped you out every time and yet you haven't had the decency to drop them a few lines and thank them. So, after seven years, my conscience has forced me to pen this note, thanking you for the help and assistance your paper has given me and congratulating you on the excellence of all the subjects covered therein.

"I have no complaints or criticisms to offer, I read every article that is printed, built practically every receiver described, recommend the circuits to anyone who asks me about them, and have no qualms, because I know that they will work and work well. I never miss reading the Editorial, Off the Record; Answers to Correspondents has provided me with much useful information. As a matter of fact I do not think there is anything between the two covers that I do not read.

"So once again expressing my appreciation of 'Radio & Hobbies,' and of the fine work you are doing for home constructors and hobbyists and thanking you once again for the assistance and excellent information I have gained."

K.B. (Port Melbourne, Vic.) renews his subscription to "Radio & Hobbies" and asks a number of technical questions.

A. Yes, a B battery eliminator was fully described in the November, 1942, issue, but included also provision for "C" bias. If the bias voltages are not required, simply ignore the whole of the back-bias network and treat the transformer CT as the B-minus connection. The dial used on the little one-valve set was an old type which is probably not generally available now.

N.T. (Mt. Tully, Q.) writes in appreciation of "Radio & Hobbies," and says that he has recently completed the one-valve set featured in the July, 1946, issue, on which he receives South Australian and Victorian stations quite plainly.

A. Many thanks for your report on the set, N.T., and we are delighted to know that it is operating so well. Keep on with your set building and you can rest assured that "Radio & Hobbies" will continue to publish many articles of interest.

E.K.B. (Gladstone, Q.) suggests that we would help readers a lot by publishing all available information about disposals equipment which is now being sold through various channels.

A. No doubt articles of this nature would be helpful if only we could handle them, but the enormous variety of the equipment, numerous ways in which it can be "wrecked" and adapted and the time and space which would be involved, would make the job much bigger than we could hope to handle. Furthermore, only a limited number of readers have ready access to the supply sources, so that much of what we might print would have very restricted interest. Regarding your second suggestion, many readers have requested more frequent issues of "Radio & Hobbies" or larger issues at increased price. However, there is far more to it than simply taking a concensus of opinion. We are fully alive to the possibilities of the magazine and will naturally take forward steps just as quickly as we are able to do so.

J.M. (Camberwell, Vic.) requests an article explaining in detail the operation of a rectifier and power supply.

A. Thanks for your letter, J.M., and the suggestion, but we cannot promise an article on the subject at short notice. Despite our increased size there seems to be so much to publish, all these things have to take their turn.

B.N. (Broken Hill) wants to use a pair of 130 ohm earphones with a crystal set.

A. An impedance of 130 ohm is really too low to expect good results from a crystal set when connected in the ordinary way. However, it may help matters to use a 5 : 1 audio transformer as an impedance matching device. Connect the grid winding across the normal earphone terminals and connect the earphones across the plate winding.

R.H. (Heidelberg, Vic.), advises that he is having difficulty with a portable receiver, the setting of the volume control affecting the filaments.

A. It is a rather difficult to see the connection between the setting of the volume control and the fact that the filaments do or do not operate. However, if your receiver employs a combined volume control and an off-on switch, it is possible that one is affecting the other adversely, so that a replacement of this unit may cure the trouble. On the other hand, some short circuit or intermittent contact may have developed in the wiring which close inspection may reveal. There is really little else we can suggest.

A.G. (Newcastle, NSW) writes in appreciation of the "1Q5-two," but suggests that we should continue the process of adding valves to this receiver, so that it would ultimately become a 4-valve set, which can be of use with a loop aerial as a conventional portable.

A. Many thanks for your suggestion, but you apparently fail to appreciate the fact that we simply cannot go on adding valves in this way to a regenerative receiver. One can build it up to a two or even three valve set but, beyond that, satisfaction is only likely to be obtained from a superhet circuit. Thus, in actual practice, the scheme of gradually building up to a modern portable does not work out quite as simply as you suggest.

A.L.A. (Mudgee, NSW) says that he has been a constant subscriber to "Radio & Hobbies" since the first issue, but suggests that it might be a good thing to number he pages of each individual volume consecutively instead of individual numbering for each issue.

A. Many thanks for your interest in "Radio & Hobbies" and your suggestion A.L.A. The idea is one that we have considered at various times, but there is something to be said against the scheme as well as on its behalf. At this stage we do not feel inclined to put it into operation.

A.G.H. (Hawthorn, Vic.) forwards his subscription to "Radio & Hobbies," and is enthusiastic with the results obtained with the "1Q5-one" receiver.

A. Many thanks for your subscription, which has been recorded. We are delighted to know that the "1Q5-one" is going so well, and note your interest also in the "Checka-meter." We will keep in mind your suggestion about the soldering iron, although we cannot make any promises just now.

P.W.B. (Randwick, NSW) asks whether it is feasible to feed exponential horn loudspeakers over a mile length of 500 ohm line.

A. The governing factor would be the d-c resistance of the line in question. We have no figures on the particular type of wire which you propose to use, but it should be quite satisfactory provided the total d-c resistance of the two leads does not exceed about 100 ohms. If it is below this figure, so much the better. It would not be wise to choose a line impedance in excess of 500 ohms, as the capacity between the parallel wires may be sufficient to cause severe losses.

HOW TO SUBMIT YOUR QUERY

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.

2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."

3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."

4. Blueprints of exact size chassis layouts with all essential holes and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2728C, GPO, Sydney.

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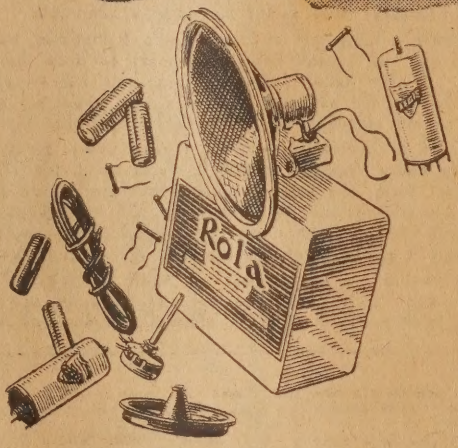

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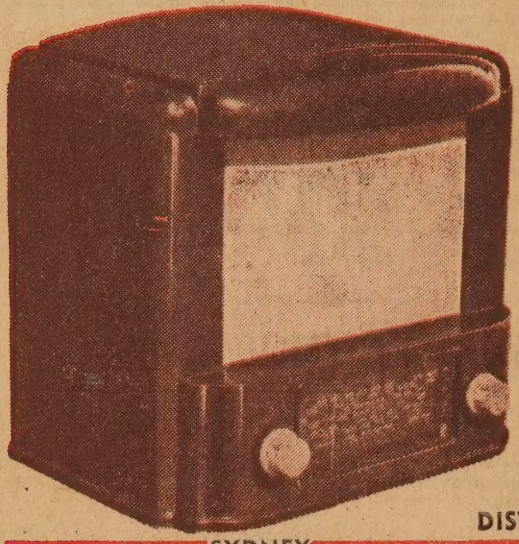

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E.J.D. (Paddington, NSW) says he likes ading "Radio & Hobbies," but would appre-te articles explaining the intricacies of ematic diagrams.

A. Many thanks for your appreciative re-arks E.J.D., and we trust that you will ntinue to find articles of interest in our gazine. An article on reading circuit grams was published in the July, 1942 ue, which you may be able to borrow om a friend. We have in mind to pre-re further articles on the subject, but nnot indicate just now when they may pear.

W.D.B. (Mullewa, WA) writes in apprec-ation of "Radio & Hobbies," but suggests at we should give more space to ac-dc uipment.

A. Many thanks for your letter and we ite understand your feelings about ac-dc ts. However, as you are doubtless aware, lves necessary for the design of these ceivers have been almost unprocurable. nother point is that we are not at all ppy about encouraging folk to build ac-sets who may not fully understand the tendant dangers. We will keep your re-uest in mind, but cannot make any promises st at the moment.

J.H.W. (Epping, NSW) reports having built a T.R.F. receiver using triode connected pe 6V6-G valve in the output stage.

A. Many thanks, J.H.W., for your interest-g letter about this receiver. We certainly ve no bias against the T.R.F. receiver id doubt if there is any real argument om the quality point of view of T.R.F. rsus straight superheterodyne. However e plain fact of the matter is that the erage listener does not appreciate sustained eble response and, in many districts the aracteristics of a T.R.F. receiver cause lot of bother due to lack of selectivity id heterodyne whistles between adjacent ations. The superhet wins every time when is simply a matter of building a set which unds well and is capable of tuning a aximum number of stations for its size. e are not impressed by your idea of using iode-connected 6V6-G valves, as their aximum power output is less than half iat with the tetrode connection. This ap-ears to be a disadvantage when tetrode eration can improve on the results as raight triodes by the proper application negative feed-back. However, we do not the least doubt that your receiver sounds ry well.

N.T.W. (Mt. Pirry, Qld.) says he is very terested in amateur equipment, but sug-sts that we would do well to give more pace to equipment for battery or vibrator eration.

A. Thanks for your letter and we quite gree that the subject is due for some at-ntion. However, now that the wartime ars have passed we find ourselves having start all over again describing equipment r our many thousands of new readers and will take quite a few months to catch up h all the jobs we have to tackle. Sooner later we will get around to the battery d vibrator operated amateur gear, but it too early to make and promises just yet.

L.H.M. (Beaufort, Vic.) advises of a change address and also writes in appreciation "Radio & Hobbies" in its present en-rged form.

A. We have made a note of your change of ddress and thank you for your kind re-arks.

W.L.N. (Cammeray, NSW) advises of a hange of address and has some nice things say about "Radio & Hobbies."

A. Thanks for your letter, W.L.N., and the ange of address has been duly noted. orry your good lady was disappointed with ie omission of the "Household Hints" ature, but it had to be dropped during the ar years.

M.C.W. (Brisbane, Qld.) sends along a hint r our "Reader Built It" page.

A. Many thanks for your letter which was assed on to us by the Advertising Depart-ent. Your hint has been filed for possible se at a future date.

H.W. (Christchurch NZ) sends in a circuit a three valve receiver using the high ten-on supply of only 18 volts. Satisfactory udspeaker reception is obtained from quite few stations.

A. Many thanks for the circuit and ex-anatory letter and we may reproduce it you suggest. Our statement that 45 or ore volts is required on an output valve work a loudspeaker is not difficult to stify, since the audio power which any lve can deliver with less than this plate ltage is very limited. It all depends on e sensitivity of the loudspeaker used and hat you consider individually to be a satis-ctory level of listening and quality.

J.M. (Glebe Point, NSW) is anxious to build a small portable receiver for use in a ty office.

A. We have a number of portable circuits our files, the smallest superhet being the entagrid Portable," described in the Christ-as, 1939, issue of "Radio & Hobbies." You n obtain a copy of this, together with the ring diagram and parts list, by writing in through the postal query service. Sorry, but we are unable to supply any further details of the RCA circuit in the September issue, but you should not have any difficulty in obtaining a 67.5 volt battery. As an alterna-tive to a regular portable receiver which would be fairly costly to build, why not build our Little Jim Two circuit featured in the December, 1946, issue. This would normal-ly be used with earphones.

A.J.B. (Yea, Vic.) sends in his subscription to "Radio & Hobbies" and makes a number of suggestions.

A. Thanks for your subscription and for your letter, which was read with interest. Sooner or later we will certainly get round to the job of describing special aerial sys-tems but, as you will appreciate, a lot of experimental and constructional work must precede the publication of any of our articles, and there is a limit to the amount of work we can get through. We can make no promises of further articles on electric clocks as these are of a very special nature.

N.C. (Trafalgar, Vic.) reports having built up the Amateur Junior with good results, using a 6J7-G as detector and a separate BFO.

A. Many thanks for your report on the set and glad to know that it is performing so well. We also are pleased to note that we were able to clear up the other doubt in your mind. Better luck next time with your AOCP examination.

Parallel Transformer Wiring

Is it possible to connect two light duty power transformers in parallel so as to obtain a higher current rating? For example, can two 60 milliamp transformers be connected together to give a 120 milliamp rating?

WHETHER this can be done or not depends entirely on the transformers themselves. Before any windings are connected in parallel, it is necessary to make sure that they are rated to deliver exactly the same voltage. Thus two 385 volt high tension windings could be connected in parallel, but not one 385-volt and one 300-volt winding.

In the latter case, the lower voltage winding would impose a direct load on the higher one, while most of the current drawn by the output circuit would flow from the 385-volt winding; it would thus tend to heat up rapidly, and would be worse off than it there were no parallel winding at all.

If both windings have the same voltage rating, there will be little or no mutual loading and the external load current will automatically be shared between them.

This is further ensured if it can be arranged that the two transformers connected in parallel are of similar manufacture and model. Under these circumstances it could be assumed that the windings would match up, not only as regards output voltage, but also impedance, which naturally influences the peak currents flowing.

Normally, care would have to be taken to see that the mains leads were applied to equivalent tappings on the primary windings, not the 240 tap on one transformer and say, the 260 tapping on the other.

However, if one transformer tends to heat up more than the other on load, it would indicate that, for some reason or other, it is taking the greater portion of the load current. In this case, moving the mains tapping from 240 to 260 volts on the warmer transformer of the two would reduce the voltage delivered and possibly help to share things out more equitably. However, this is just given as a suggestion and would have to be the subject of experiment.

Even more vital than the voltage is the matter of phasing. Readers should be acquainted with the nature of alternating current and will realise that, at a particular instant, one end of the high tension secondary winding will be positive with respect to the earthed centre-tap, and the other end negative. On the alternative half-cycles, the position will be just the opposite.

When two windings are connected in parallel, it is then obviously necessary to see that things are arranged so that the ends of the windings connected together are swinging alternately positive and negative at the same time. Otherwise a direct short-circuit will result.

To guard against this possibility, a check for phase should be made before any of the permanent wiring is connected to the transformer panel.

It is well to note that the mere inter-connection of identical terminals on the transformer panels is not sufficient guarantee that the phasing will be correct, since the leads from the windings might conceivably be brought out in a different fashion to the terminal lugs.

Having mounted the transformers in the chassis, connect the two primaries together permanently and connect a length of power flex for the power lead. Join the two high-tension centre-taps and connect them to earth or to the bias circuit as required.

Solder a short length of insulated lead to one of the high tension secondary lugs, switch on the power and brush the lead rapidly across the corresponding terminal lug on the other transformer. If there is no spark on contact, the two halves of the winding must be in phase.

A violent spark on contact would indicate that the phases were different and that the cross connection would have to go to the other lug.

Having linked two of the high tension terminals successfully, the remaining two can be linked across, since they will necessarily be in phase.

Once correctly installed, this parallel wiring should not be disturbed. Particular care is necessary with the two leads joining the primaries, as it is very easy inadvertently to reverse these. Of course, it does not matter which way the actual mains lead connects into circuit.

As far as filament windings are concerned, it is usually not necessary to connect these in parallel, except perhaps when it is desired to operate a 3-amp. rectifier filament from two parallel-connected 2-amp windings.

In this case there are no earthed centre-taps to worry about. Simply connect one terminal of each winding together. Then take another short length of wire and touch it across the two remaining terminals with the power on. No spark indicates correct phase, a spark indicates that the leads have to be reversed.

Exactly the same procedure can be followed with other filament windings which it is deemed necessary to connect in parallel. Note that a single centre-tap connection to earth is sufficient for both windings, so that, where both have a centre-tap, it is suggested that only one be earthed.

This is only a very minor point, but it does save a wire and also minimises any mutual loading between the windings if the individual centre-taps happen to be a little out of balance.

Where a single filament winding is capable of supplying the necessary voltage and current for a particular valve or combination of valves, there is little point in paralleling other windings with it.

Where a large current has to be drawn, it is better as a general rule to provide a single power transformer to do the job. However, the matter of supply and finance sometimes comes into it and paralleling transformers as described can be a perfectly satisfactory way out of a difficulty.

WANTED TO BUY, SELL OR EXCHANGE

Readers wishing to buy, sell or exchange goods are invited to insert an advertisement in this column. The cost is 9d per line; minimum charge 2/3. Approximately 6 words to a line. Advertisements for the next issue must reach our office by WEDNESDAY, FEBRUARY 5. Dealers advertisements not accepted.

EXCHANGE brand new "Radameta" modulated oscillator (unused) for communications type receiver or other "ham" gear. For sale: RCS 5-band coil unit (9.8 to 550 metres), perfect order. What offers? **A. Cormack, 119 Russell-rd., New Lambton, Newcastle.**

EXCHANGE. 3-valve Portable Radio (battery), for Bike, Tools, Camera, etc. **Carlton, 20 Bagdad St., Regents Park, N.S.W.**

EXCHANGE. Modulated Oscillator in good condition, for Typewriter. Particulars to **N. Hart, Box 24, Bellingen, N.S.W.**

FOR SALE: The following valves, all guaranteed and unused. 3 807 15/- ea. 6V6E and 6V6GT, 10/- each. 5U4G, SY4G, 2X2, 2B3G, 33's, all 10/- ea. Also Henney's Principles of Radio £1, Audle's Radioman's Guide 17/6, Admiralty Handbook, Vol 2, 7/6. 500 microamp meter (2") 17/6. **H. Brasch, 94 Hotham St., East St. Kilda, Vic.**

FOR SALE. Bendix 8-valve Communication Recvr. 2-20 mcs.; several crystals with holders between 4 and 6 mcs.; 10in. Permag. Spkr. P-P Trans.; Genemotor 28-32v. input, 200v. 60 ma output and small circular sawbench, suit home w'shop. FM6015. Havyatt, **264 New South Head Rd., Edgecliff, N.S.W.**

FOR SALE. University Supertester A.C. Model. £27. University Universal Speaker, £15. Both instruments guaranteed new, complete with instructions. Or best offer. Also quantity of Radio Text Books, £5. **33A Carroll Street, Kogarah, N.S.W.**

FOR SALE. 1-valve Battery Set, complete with Phones and new Batteries, £4; also Battery Little Jim, all new, complete, £5. Philips "B" Eliminator, £1/10/-. Reply **Box No. 9993, Radio & Hobbies.**

FOR SALE, used 19 watt P/A System, less Microphone. Consists 6-valve Amplifier (P/P 6F6's), with two 8/20 Speakers, in Trimac Square Flares. Price £16/10/-. **F. E. Bound, Leahy Street, Nhill, Vic.**

FOR SALE. G.12 Speaker, 10,000 ohm C.T., 3500 ohm field mounted in speaker cabinet with field power supply unit. Reasonable offer. **Gawler, 2 Melbourne-avenue, Glenroy, Vic.**

FOR SALE. Huge quantity all Radio parts except Speakers. Selling out on account leaving Aust. Write for your needs. **G.P.O. Box N1137, Perth.**

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FOR SALE. R. & H. Sept., 1943, to date, also 7 late Radio Craft, good condition. **J. Stack, 24 The Boulevarde, Cammeray, N.S.W.**

FOR SALE: One Crystal Set and one valve 201A type and earphones, £5/10/-, or near offer. **Mr. D. Droney, Clifton, Qld.**

SALE: 5-valve Pentode B/c Kit, complete in every detail. All parts new except transformer and speaker. Circuit supplied. Bargain £9. Also new R. & H. Portable in proper cabinet with batteries. Performance good, £15; Palec Multimeter AC/DC, in carrying case. Perfect order guaranteed, £8. Apply **D. Adams, 81 Beaumont St., Hamilton, N.S.W.**

SELL. Radio parts, including 2 double gang 8in. dynamic speaker, valves 32, 227, IK6, B406, A609, 1H6, PM22A, 6 audio transformers, power transformer, 6 single gang condensers, reaction condensers, fixed condensers, valve sockets, voltage dividers, etc. Quick sale £6 lot. **H. Gale, Fish Creek, Sth. Gippsland, Vic.**

SALE. Current model Palec Signal Generator as recently purchased. Intending buyer may check over and verify both purchase and reason for sale. £50 complete and new. **Box 9986, Radio and Hobbies.**

SALE. Elec. Steel Guitar, with tone and vol. control, in case; complete with 6-valve 14w. portable amplifier, suitable P.A. work, mik. input. Prfct condition. No offers. £37/10/-. **F Townsend, Box 74, Canowindra, N.S.W.**

SELL. Kit Parts Pent. 4 includ. 10/42 spkr., new 2-volt accum. £11 or offers. Also Philips B & C Elim. (new valve), R. & H., Vol. 1, No. 1 to present issue. Offers **A. Dabelstein, Drury St., Windsor, Brisbane.**

SELL. Vernier Dial 3-gang Cond. AER R.F. Osc. Coils 2 IFS, band sw. for receiver, 2-20 megs., 35/-. 4 IFS, 755kcs., 3-gang cond. Vernier dial, 2-6 x 5GT, 35/-. **3 North Ave., Leichhardt.**

SELL. A.W.A. 3-valve FS6 Transmitter for phone and CW operation, complete with power pack for 6-volt operation. What offers? For further particulars write **J. A. Rogers, "Waverley," Bell, Qld.**

SELL. New (2 of each) 1D5GP, 1C7G, 1L5G, 1J6G, 1H4G, 10/- each or exchange something useful. **G. K. Fisher, 7 Cowell Street, Gladesville.**

SELL Philips B.C. and B. Emmco B. Eliminators, 15/- each; 2 three, 2 two Gang Conden., 5 Power Trans., Coils, etc. **1 Keysor Road, Pagewood. FJ1257.**

SALE: Gramo Motor and Turntable, also 3-gang Condenser, 18/-. **B. Hinwood, Bickell Road, Mosman, N.S.W.**

SELL. 15 Copies of Radio and Hobbies. 6—1939, 9—1940. £1. **47 Godfrey Street, Banksia.**

SALE: 5in. permag. speaker, also 5in. electrodynamic 1500 ohm. field, new. 27/6 ea. **V. J. Yalden, 267 Victoria-ave., Chatswood.**

SALE: 4 Valve B/C Mantel Set in Fireside 5 Cabinet and USL/44 Dial. Value at £10. **W. Robertson, 16 Smith St., Mayfield East.**

WANTED. "Radio and Hobbies for Sept., 1943; "Radio and Hobbies," Vol. 1 No. 1; "Radio and Hobbies" Vol. 2 No. 6 State price in reply. **G. King, 105 Ridge St., Greenslopes, S.E.2, Brisbane, Qld.**

WANTED R. & H., Feb., 1943. Sept., Oct., Nov., 1944. Also urgent, 8in. Permag Speaker, must be good condition. **M. G. Rawolle, Eudunda, S. Aust.**

WANTED: Popular Science Magazine, Nov. & Dec., 1946. Complete in good order. Will pay 2/6 ea. Write **J. R. Crawford, Bungowannah, via Albury, N.S.W.**

WANTED Buy all R. & H. to Feb., 1943, also May, June, '43, Oct., Nov., '45, good condition. **C. R. Webber, 40 Eton Street, Malvern, S.A. Phone U7046.**

WANTED: 302 Barretter and 25L6 or 25A6 (new preferred), also AC-DC Gramo Motor. **J. Knight, 15 St. Vincent Place, Albert Park.**

WANTED: One "F" type Phone, condition immaterial, also two Trays for PSU Type "G" (AT5/AR8). **P. W. Butler, 1 Darley Road, Randwick, N.S.W.**

WANTED: Copy Radio & Hobbies, January, 1944, issue. **E. Coote, 24 Palmer St., Dover Heights.**

WANTED: 8in. or 10in. Speaker. Also cone for 6in. speaker. **A. Fairleigh, 25 Hunter St., Merewether, Newcastle.**

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